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HERE ARE A FEW EXPRESSIONS FROM SOME OF THE READERS OF THE NEW EDITION

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MUNICIPAL ENGINEERING

VOLUME XXX. MAY, NINETEEN HUNDRED SIX. NUMBER FIVE.

NOTES ON SEWER DESIGN.

By J. C. Herring, Consulting Engineer, Jefferson City, Mo.

The first thing preparatory to laying out a sewer system is to make a complete topographical survey of the proposed sewer district, showing the surface elevations of streets and alleys, and elevation of basements and other points to be drained.

Next make a map of the district showing the proposed location of laterals, mains and joint sewers. Laterals may be designated by numbers, as Lateral 1. Mains may be designated by letter, as Main A. Joint sewers carrying two or more mains may be designated as Joint Sewer No. 1, etc.

The next thing will be to consider the size, material and form of the mains and laterals. These will depend on the gradient and the nature and amount of sewage to be carried. Large sewers running less than half full require more fall than one carrying a larger per cent. of its capacity. As soon as the sizes of the sewers and the gradients have been decided upon, commence at the outlet of the main sewer and fix the relative elevations of the main outlet, the lateral outlets and the lateral heads. The elevation of the laterals will next have to be considered since they must be low enough to drain all cellars and basements, present and prospective; also provision must be made that the flush-tanks shall be safely below the surface.

After finding in this way the maximum elevation of the lowest (relatively) point on any of the laterals the absolute elevation of the entire system can be readily fixed, provided it does not throw the outlet too low. Should it be found to be too low, see if the courses of the most troublesome laterals cannot be changed or a special and more direct outlet planned for the few places that are too low for the laterals that should drain them.

Having decided all these points and established the sewer grades, the next thing to do is to make profiles of the entire system showing both sewer and surface elevations and marking all points where flush tanks, lamp holes and Y connections are to be placed and designating size and material of same.

The next step is to prepare plans and specifications, making them cover as nearly as possible all points in the work.

An approximate estimate of the cost can now be made out and should contain the items as given on the proposal sheet. To a close estimate add about 15 per cent. to cover contingencies.

The estimate is now included in a report to the Council. If the Council decides to have the work done and to let it by contract to the lowest bidder the next thing to do is to advertise for bids, and, if one of the bids is accepted, to let the contract.

Construction.—The engineer should be on the line of work at all times to give lines and grades and inspect materials and work, and see that they come up to the requirements of the specifications.

He should be provided with a note book, in which a daily record should be kept showing items like the following:

Date. Jan. 28, 1904.

Main A. 10 ft. in diam. 3 courses of brick, laid in Portland cement mortar. Proportions, 1-3.

Brand of cement, ... Brand of brick, ... Quality of sand, ... Began this morning at Sta. 48 plus 16.

Elev. of flow line, 125.62.

Sta. 48 plus 25, manhole at entrance of laterals 1 and 6.

Main sewer flow line, 125.70.

Lateral 1 flow line, 134.20.

Lateral 6 flow line, 136.50.

Manhole cover, 142.36.

Bottom of trench, stiff clay.

Stopped work at Sta. 51 plus 36.

On laterals the notes should show location and elevation of all Y connections, lamp holes, flush tanks, etc.

For convenience and to preserve lines and grades oak stakes about two inches square and fifteen inches in length should be placed about fifty feet apart and on a line parallel with and from two to ten feet distant from center line of the sewer. These stakes will not likely be disturbed and can be referred to at any time.

Be careful that both line and gradient be straight between manholes and lamp holes, so that in case of stoppage the point of trouble can be readily located.

Manhole and lamp-hole covers should be placed at established grade. When crossing streets or alleys, or following along same, the top of the sewer should be not less than three feet below the surface or the established grade to be safe from the crushing weight of the street roller when compacting sub-grade. The depth below surface at other points depends somewhat upon the climate. Three feet, however, should be considered as a minimum.

Sewer Record.—After the sewer is constructed a sewer record book should be made. On one page should be a map of a portion, say one block, of the district, and on the opposite page should be a profile of the same. This book should give size of pipe, location of connections, manholes, lamp holes, flush tanks, etc., giving both flow line and surface elevations. Whenever connections are made they should be recorded in this book, giving date, name of house owner and of plumber. This information can be easily obtained if an ordinance is passed requiring permits before connecting and providing for official inspection.

Apparatus for Setting Grade.—Drains and sewer trenches can be dug to any required gradient by means of a grade triangle. The higher the triangle is in proportion to its length the more accurate it will be. They are usually constructed with the bottom board from ten to sixteen feet in length. To construct be careful to make the side pieces of equal length and fasten the lower ends to a straight board of the desired length; fasten the top ends together, and from the center of the top joint suspend a good plumb bob. Mark two points on the bottom board, say, ten feet apart and at equal distances from the center. To set for the required gradient drive two stakes ten feet apart, or the distance previously measured on the bottom board. Suppose we wish to set it to a 5 per cent. grade: 5 per cent. equals 5 ft. in 100, or 0.5 of a foot in 10 equals 6 inches. By means of a spirit level drive one of the stakes six inches lower than the other, set the triangle on the two stakes and make a mark on the board under the point of the plumb bob. In this manner any desired gradient can be marked on the triangle. You can now commence at one end of your ditch, drive a stake to the desired elevation, set your triangle on it and drive a stake at the other end so the plumb bob will stand over the gradient point when the triangle is resting on both stakes. In this way you can go from one stake to another as far as desired.

Making Sewer Connections.—Plumbers should always be required to make the house connections through Y's in the lateral instead of being allowed to cut holes in the lateral. This statement may seem unnecessary, but is warranted from the fact that in many small cities where the inspection is lax or wanting the plumbers are in the habit of breaking a hole in the lateral if there happens to be no Y pipe or if they have not been able to locate the precise position of the Y. If there is no Y accessible it is better to take out a joint of the straight pipe and replace it with a Y joint. To do this, break off the top half of the bell of the piece to be removed and of the next joint below it, loosen the joint you wish to remove, turn it half way around and it can be lifted out. Break off the top half of the bell of the Y joint and put in the place of the joint removed and make a good closure with Portland cement mortar.

COST OF CONSTRUCTION OF SEWERS.

Marysville, Kan., in 1902 built a system of sewers at the following contract prices:

12-inch pipe, foot	$ .54
10-inch pipe, foot	.50
8-inch pipe, foot	.36
6-inch pipe, foot	.36
Manholes, each	28.00
Lamp holes, each	7.00
Flush tanks, each	62.00
Stone masonry, cubic yd	3.00
Concrete (extra), cubic yd	4.00
Lumber B. M., per M	20.00
Rip-rap, sq. yd	.60
Rock excavation, cubic yd	2.50
3-inch tile drains, foot	.045

Prices of materials and wages were as follows:

Sand, yard	$ .80
Cement (Louisville), per brl. (300 lbs.)	1.50
Cement (Ft. Scott), per brl. (2 sacks)	.90
Cement (Portland), per brl	2.50
Gravel for concrete, yard	.90
Rock, perch	.80
Brick, per M	8.00
Oakum, per cwt	2.50
10-inch junction pipe, foot	.304
10-inch plain pipe, foot	.168
Six-inch plain pipe, foot	.075
¾-inch galv. iron pipe, foot	5¼

Wages, from $1.50 to $3 per day.

Notes on above work:

50 pounds of oakum lays 600 feet of 12-inch pipe.

1 pail of cement lays 6 joints of 12-inch pipe.
15 (50-lb.) sacks of cement for a 12-foot manhole.
1,500 brick required for a 12-foot manhole.
1,000 brick required for a flush tank.
1 pail of cement required for 20 joints of 6-inch pipe.
1 pail of cement required for 15 joints of 8-inch pipe.
1 pail of cement required for 10 joints of 10-incn pipe.
1 pail of cement (neat Portland) washes a 12-foot manhole.
½ cubic yard of concrete required for base of 4-foot diameter manhole.
Same for lamp hole.

A portion of the main sewer at Jefferson City, Mo., was built by contract at the following prices:

Furnishing and laying 10-in. pipe, including cement joints, foot	$ .17
Furnishing and laying 12-in. pipe, including cement joints, foot	.21
Furnishing and laying 15-in. pipe, including cement joints, foot	.29
Furnishing and laying 18-in. pipe, including cement joints, foot	.45
Furnishing and laying 21-in. pipe, including cement joints, foot	.69
Furnishing and laying 24-in. pipe, including cement joints, foot	.85
Price per flush tank, including material, excavation, labor and royalties	45.00
Price for brick reservoir for flusher, including everything	40.00
Price per manhole, 5 ft. and under, including everything	22.00
Price for manhole for each additional ft. over 5 ft.	3.00
Price per lineal ft. for excavation and back-filling under 6 ft.	.195
Price per lineal ft. for excavation and back-filling 6 to 8 ft.	.25
Price per lineal ft. for excavation and back-filling 8 to 10 ft.	.32
Price per lineal ft. for excavation and back-filling 10 to 12 ft.	.42
Price per lineal ft. for excavation and back-filling 12 to 14 ft.	.52
Price per lineal ft. for excavation and back-filling 14 to 16 ft.	.65
Price per lineal ft. for excavation and back-filling 16 to 18 ft.	.75
Price per lineal ft. for excavation and back-filling 18 ft. and over	.90
Price per cu. yd. for rubble masonry	4.00
Price per cu. yd. for concrete masonry	4.00
Price per 1,000 B. M. for timber in foundations	20.00
Price per lineal ft. for water supply pipe, incl. pipe and labor	.45
Price per cu. yd. of embankment	.30
Price per ton for iron pipe, white lead, joints complete	45.00

Final estimate showing actual cost of constructing sewers in subdivision A of sewer district No. 9, city of Jefferson, Mo., 1898:

8-in. pipe with Y's, complete, 4,029 ft. at 13c	$523.77
10-in pipe with Y's, complete, 248 ft. at 35c	86.80
Lamp holes, complete, 2 at $5	10.00
Flush tanks, complete, 2 at $60	120.00
Manholes, complete, under 5 ft., 9 at $22	198.00
Manholes additional, over 5 ft., 44 4-10 ft. at $1.70	75.48
Excavation and back-filling, 0 to 6 ft. at 9c	217.00
Excavation and back-filling, 6 to 8 ft. at 13c	66.74
Excavation and back-filling, 8 to 10 ft. at 18c	117.18
Excavation and back-filling, 10 to 12 ft. at 27c	147.96
Excavation and back-filling, 12 to 14 ft. at 30c	49.80
Concrete masonry, 5 1-3 yds. at $3	16.00
Solid-rock excavation, 10 cu. yds. at $1.65	16.50
¾ water supply pipe, complete, 300 ft.	65.00

Cost of constructing sewers in district No. 10, Jefferson City, Mo., 1904:

Price per lin. ft. for furnishing and laying 8-in. pipe, including Y's, branches and Portland cement joints, 2,242 ft. at 18c	$403.56
Price per lin. ft. for furnishing and laying 10-in. pipe, including Portland cement joints, 695 ft. at 37c	257.15
Price per lamp hole, including all materials, castings and labor, 7 at $6.50	45.50
Price per flush tank, including all material, excavations, labor and royalties, 2 at $70	140.00
Price per manhole, including all material, castings and labor, for 5 ft. and under 6, at $37	222.00
Price for each additional ft. for manhole over 5 ft., including all material, castings and labor, 28 at $2.50	70.00
Price per lin. ft. for excavation and back-filling under 6 ft. deep, 1,044 ft. at 18c	187.92
Price per lineal ft. for excavation and back-filling from 6 to 8 ft., 1,015 ft. at 24c	243.60
Price per lineal ft. for excavation and back-filling from 8 to 10 ft., 850 ft. at 35c	297.50
Price per lineal ft. for excavation and back-filling from 10 to 12 ft., 110 ft. at 40c	44.00
Price per cu. yd. for solid-rock trench, 60 at $3.50	210.00
Price per cu. yd. of embankment, 100 at 25c	25.00
¾-in. water supply pipe, with boxes, faucets, etc., 150 ft. at 23c	34.50

CEMENT BLOCK ARCHITECTURE.

By Louis H. Gibson, Architect, Indianapolis, Ind.

In a paper which I prepared for the convention of the National Association of Cement Users at Milwaukee I said: "I could never have hesitated long in accepting the cement block idea. I have hesitated long, however, in agreeing to accept cement blocks as at present manufactured. I have recognized the inherent merits of concrete construction and from the beginning have felt that making concrete in block form was a worthy building and commercial enterprise; but as one interested in architectural work the actual results of concrete block manufacture have been such that, until recently, I have felt that I could not afford to encourage and foster this industry. I do this now in this way, not because of any decided encouragement through specific results, but on account of what I recognize as a possibility. I know that a worthy cement block can be made commercially."

This statement was made because I recognized the merits of concrete as a building material and because it is desirable to fabricate concrete into block form. I knew that the block machine was a logical former of concrete for building material. I did say, at the Milwaukee convention, that I had never seen an artistically successful structure executed with cement blocks. In this number I am pleased to present a number of pictures of successful structures erected in block form. They are not the ordinary hollow block, turned out on a machine in the ordinary way, but that does not stand for any large material difference. Here are cement blocks, cast of concrete, made with a properly formed aggregate and a proper proportion of cement, properly finished and presenting wonderfully artistic results. Had I seen the pictures of these buildings before the Milwaukee convention, I should not have modified the general sense of my expression, but would have been pleased to illustrate what could be done with cement block. I was pleased to know that Mr. Charles D. Watson's paper followed mine, with illustrations by stereopticon. The cement block is an ideal form of building material, and cement stone can be made on a machine certainly as well and probably better on the average than it can be made monolithically within forms in the ordinary way, and certainly at much less expense.

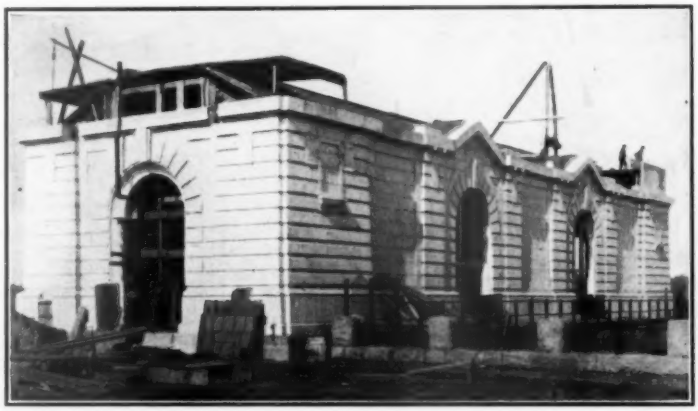
The pictures in connection with this article should serve as a stimulus and inspiration to every man who is in the ce-

CANADIAN BANK OF COMMERCE, LONDON, ONTARIO.
Artificial Stone Block Construction.

ment block business. The building of the Canadian Bank of Commerce of London, Ont., is a splendid structure, splendidly conceived and wonderfully well executed. It is built of cement blocks. Every molding, every bit of decoration and the structural parts of this building, as we see them, are of concrete. Here is a splendid example of what may be done. It requires a quality of intent, a quality of mind and a high ideal to develop this kind of material result. Idealization is all right so far as it goes. It is measurably valuable only in the expressed materialization. In the actual work it has to go from the heart of the artist, through the mind of the builder and the hands of the workman, and every step and detail of the process must carry along the same high quality of intent, sincerity and integrity. This may sound a little high-flown to be expressed in connection with so prosaic a subject as an ordinary building operation, or to present to the ordinary, everyday worker, but it is the difference between the prosaic, common, low-down view and the view of the idealist that makes the difference between the ordinary ugly cement block work and the splendid expression which we see in these buildings. People are successful in business and commerce through their ability to render practical their best thoughts and bring them into material form to the people. A high ideal expressed in concrete is a cash asset. This has been done in connection with this work.

The building of the power house at Niagara Falls is a chaste, clean, dignified design, executed in a chaste, clean, dignified manner. The builder has absorbed the spirit of the architect and given it permanent and material form. After seeing this design as here executed, who will ever again question the possibilities of cement block? There need be no doubts or difficulties in the way. One need not say that these are cast stone, or that they are not made on a machine. Machine-made blocks are cast stone, and a high grade of blocks may be made on a machine. That these blocks were cast in sand or in any other way, by hand or by machine, cuts no figure. It is concrete, and the buildings are executed through the medium of blocks.

These pictures present an opportunity of estimating the commercial value of mere design. What is it that causes one bit of dress goods, one piece of furniture, one bit of tapestry, one house, to be far more valuable than another with the same amount of material in it and the same amount of labor expended in making it? It is the design which originated in the brain and heart of the artist. It was the artist who developed the great furniture factories of Grand Rapids. The manufacturer and workmen were but vehicles for the man with the pencil who made the designs for the products. It is the artist who gives value to the raw material.

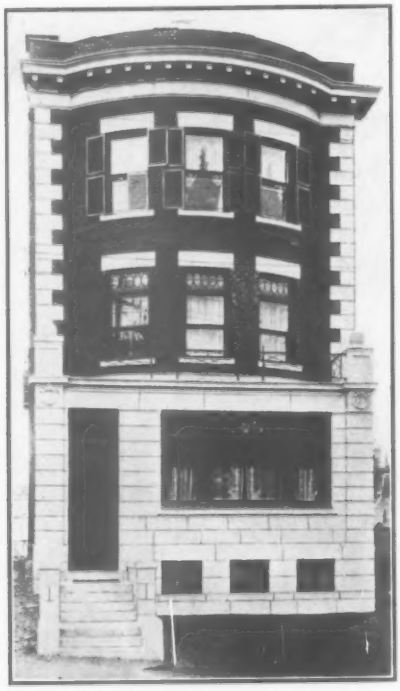


GATE HOUSE ONTARIO POWER COMPANY, NIAGARA FALLS, ONTARIO.
Artificial Stone Block Facing.

The facade of the dwelling illustrates what may be done through the intelligent combination of well-made cement blocks and brick. Then, again, it illustrates that primarily there must be the design, the drawing made by the artist and expressing a high idea of beauty; then the material which goes to the realization of the design. The drawing has an added value because of the quality of mind and

spirit which directed the expression of the thought on paper. The material is used to realize and manifest in a permanent and enduring manner the thought of the artist. In order that there should be a worthy representation, a worthy expression, there must be the design and then the hand of the craftsman and the worker.

If it cannot be art for art's sake, let it be art for the dollar's sake. People may only be induced to make beautiful cement blocks through the idea that they will get more money out of them, and



MARTER'S HOUSE, TORONTO.
Artificial Stone Trimmings and First Floor.

that is the only way that a commercial success will be made of cement block manufacture. The state of mind and condition of culture is practically the basis of all value. Beauty and art are at the foundation of a large amount of our material wealth. Take culure, if you please, and art out of the world, and it makes the gold reserve in our banks of very little value. On the other hand, added beauty and culture make the gold reserve in our banks more valuable because the people want it with which to buy. If by any process only our physical wants should be considered, by far the larger proportion of the world's capital and investments would sink into insignificance. A large measure of the wealth of France and the commercial prosperity of Germany result from the appreciation of art. England is now losing in the commercial race because of the neglect of this thought.

In the noble facade of the Carnegie Library at St. Catherines, Ont., there is shown another splendid example of a means of uniting, artistically and structurally, two expressive materials—concrete and brick. The small cut cannot show the exquisite beauty and refinement of the concrete detail. It is sufficient to say that in no other material could the spirit of the artist have been represented more sympathetically, more expressively or permanently. It is fair to state in this connection that some of the details of the capitals and other ornamental forms were carved by hand after the work had been cast and partially tooled. Through the casting process the general form was given and then, at a minimum cost, the capitals and other decorative forms could be reproduced.

At the present time the spirit of the craftsman holds the attention of the mass of the people. As presented to us through the magazines and the newspapers, the craftsman idea is sure to place the people on a higher plane, where they will ask better material expression from the workman. Expressions like these of Mr. Watson will help to elevate and fix a standard. The people have an objective. They see good work and they know that it can be done, and they are then ready to pay for it. They demand that it shall be done.

The pictures which are given in this number are selected at random from more than twenty, but they are typical expressions of excellence.

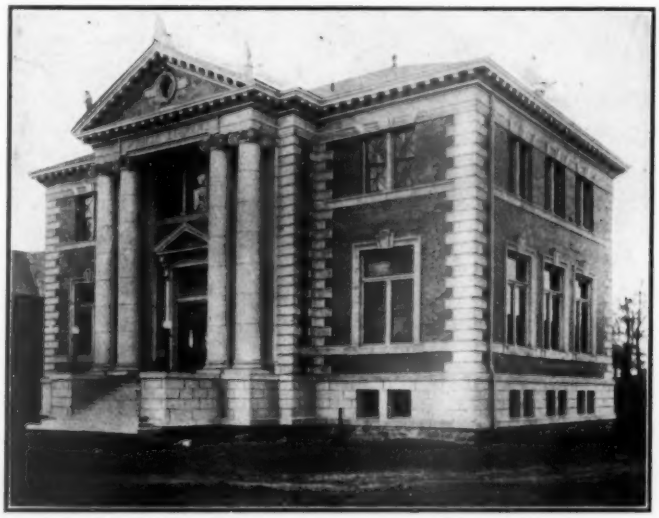
The church details show a delicacy of conception and of mechanical execution which is not so clearly represented in the other pictures, though it exists in the others, nevertheless. This print shows the fine tracery in the windows, which is of concrete, and the delicate moldings in the doorways. On the other hand, if one were able to look at the larger photographs of the other designs it would be shown that there is the same quality of refinement and sensitive expression running through all of them.

Another valuable lesson in connection with this work comes through the rational consideration of the methods of construction employed. The work of building with cement blocks, stone, brick or terra cotta is essentially a block construction, and in principle there is no relative difference in

the actual constructive employment of these materials. It consists of piling one block on another or one block against another, and does not and should not assume to be a monolithic construction. It involves the recognition and exhibition of all joints and does not allow of their concealment. On general principles the system of construction by brick, stone, terra cotta and cement block is essentially the same. The pictures indicate that these designs are an honest expression of structural methods. The joints are a part of the design.

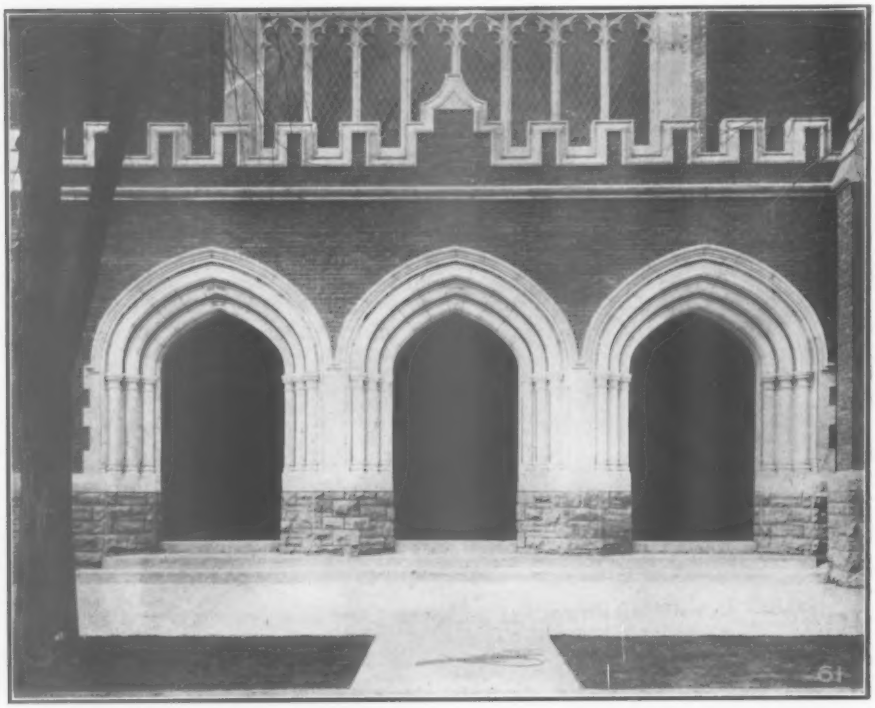
The structural forms which will naturally come out of reinforced concrete construction will be essentially different. Structural concrete methods, as expressed through the use of concrete and steel together, develop a monolithic structure—that is, a building which is practically in one piece. The design becomes a matter of external form and not an absolute expression of method used. Reinforced concrete buildings are built with a mixing machine, the wheelbarrow, the shovel, hoe, tamping tools and trowel, and their proper ornamentation will be developed through the use of molds or such forms as can be fashioned in and made a part of the structural work. Reinforced concrete construction is a casting or pouring process, and not a piling up or building up of block material. This affects the external form of the design, and, should one undertake to imitate block forms by monolithic methods, the result would be disastrous artistically. Try as we will, experiment as often as we please, and the result is all pronouncedly a failure if we consider other than an honest expression. Honesty is the best policy, surely, in art as in the commercial walks of life. Mr. Watson's work is successful because the methods employed are frankly indicated in the structural work.

Anyone who considers the work here pictured as seriously as it deserves and in its full significance must realize what this demonstration means to the concrete, the cement and the cement-block industry. Who is it that would hesitate in the use of concrete in block form of the character that is herein pictured, in competition with or in substitution for any other building material? Anyone would give it place, certainly, in preference to stone. It has a texture and structure certainly as good, possibly better and more determinable even than the oolitic limestone, than which there is no better natural stone for building purposes in the world. It is structurally fireproof, which stone is not. Certainly it would be esteemed more highly than terra cotta in its design quality. It is certainly more expressive, it has a sharper, cleaner appearance. It is structurally more stable. It certainly has a superior design value to brick. No intelligent or studious observer will hesitate in the selection of this material for any building, no matter what his ideals may



CARNEGIE LIBRARY, ST. CATHERINES, ONTARIO.
Artificial Stone Trimmings and Portico.

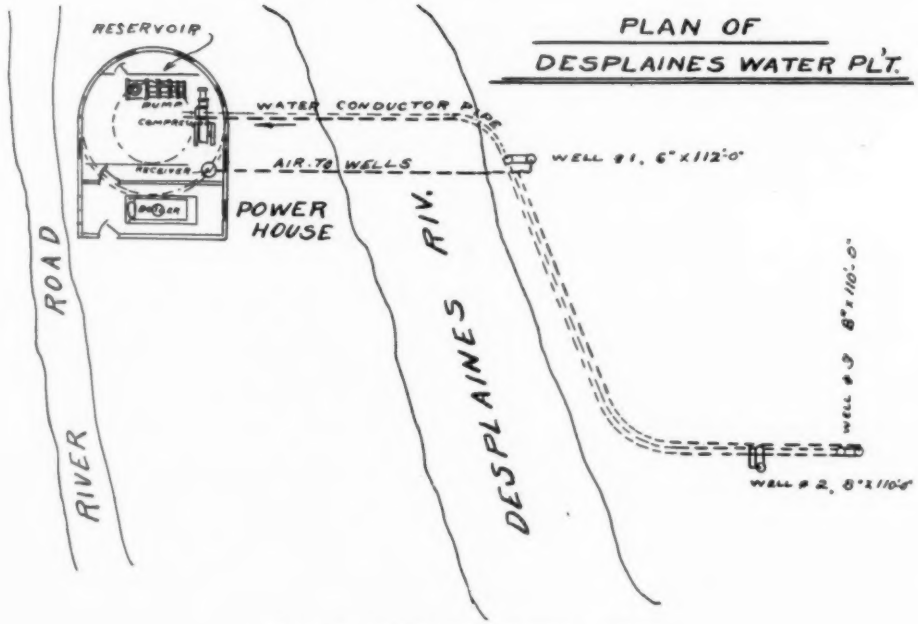
be as to artistic or structural value. After seeing this work we need not feel that it is necessary to make any apology for cement blocks as a building material. We may apologize for or feel ashamed of the man who makes the common, ugly, lead-colored, badly conceived block which we see on every hand, but we may now realize that there is no excuse for his existence as a manufacturer. Any intelligent man can do this quality of work if he has the will to do. Work of the kind we have pictured is the expression, not only of artistic, but of commercial integrity. Manufacturers who enter into this cement block work in the same spirit will realize commercial results in dollars and cents.



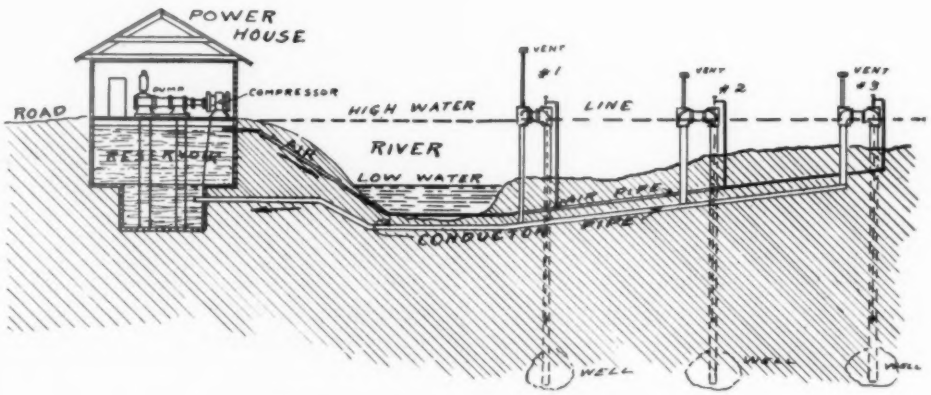
CENTRAL METHODIST CHURCH, TORONTO.
Artificial Stone Trimmings.

One who travels and observes must have noticed that the people generally are especially anxious to use cement block and that they are more anxious to use them than are people to manufacture a high-grade block. One would imagine that there had been enough bad work done in the name of cement block to have killed the business. This is not true. It appears to go on apace as though a universally high grade of building material had been presented to the public. The architect in general practice has clients coming to him all the time who insist on using a common unworthy material of the every-day cement block maker. The architect almost has to fight to keep them from being used. With anything approaching the quality of Mr. Watson's work, there is not a self-respecting architect in the country but would be not only willing, but pleased, to use this material. He would know that he could express himself adequately and permanently.

The question of dressing blocks is destined to become a very simple matter. Pneumatically or electrically driven machinery would be readily devised for this purpose as soon as there is a demand for it and as soon as the material of a worthy character for building purposes is generally produced. By this means the cost would be reduced to a minimum. The time is not far distant when people will be willing to pay quite as much for cement block for building purposes as any other structural substance. It depends on the block maker.



PLAN OF DESPLAINES WATER PLANT.

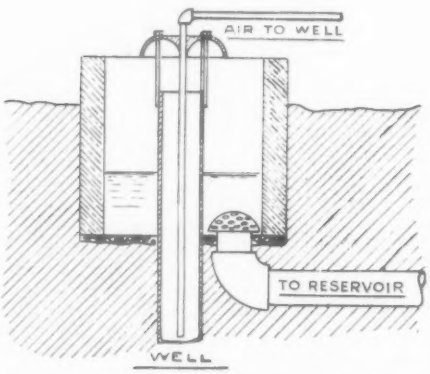


PROFILE OF WELLS AND RESERVOIR.

MUNICIPAL PUMPING PLANT, DES PLAINES, ILL.

By J. Francis Small.

Pumping water by compressed air offers at the present date nothing new in its essential features, at the same time each particular installation offers something novel in its minor details. The Des Plaines (Ill.) plant, owing to the local conditions, made a departure from



SECTION OF HEAD OF WELL WITH SMALL RESERVOIR.

the general practice, necessary to insure against any interruption to its operation throughout the four seasons.

From the profile drawing it will be observed that the reservoir and power house are built together, the walls of the reservoir forming the foundation on which the walls of the power house are placed.

It will be further noted that the reservoir and power house are built on a higher elevation than the level on which the three wells supplying the water are drilled, and that these wells are separated from the power house by the Des Plaines river.

The river is shown at low-water mark, the level at which it flows a good portion of the year. A dotted line indicates a higher level, which is reached in the spring and after heavy rains. When these floods occur the wells become entirely submerged and it would be impossible to pump them if special provision had not been made for so doing.

In lifting water by compressed air it is good practice to discharge the air into the atmosphere and get rid of it as rapidly as possible after it has performed its duty in lifting water from the well.

Where long pipe-runs from wells into a common reservoir are necessary a smaller reservoir or receiving tank is usually provided at each well, into which the water from the well is discharged, and from this tank a conductor pipe is run to the main reservoir.

The illustration herewith will give a clear idea of this system.

On account of the reservoir at Des Plaines being higher than the wells, it became evident that the discharge pipe at each well would require considerable elevation above the surface in order to raise the water to a sufficient height to permit it to run into the reservoir by gravity, after which the question arose as to the building of a separate reservoir at each well in an economical and substantial manner, and provide against the river flowing into them at high-water mark.

The solution of this proposition was to abandon the idea of auxiliary reservoirs and adopt the use of a return pipe at each well. The illustration showing the piping rising from the ground in the form of an inverted "U" will give a clear idea of the method pursued to accomplish this object.

To dispose of the air a vent was provided in the top of the wide sweep "T" forming the top of the pipe riser leading to the conductor pipe. (Note same marked "vent" in profile drawing.) By this form of construction the wells are satisfactorily blown regardless of the river's level and at the same time are closed against interference by the public, yet open to the atmosphere for ventilation.

HEAD OF WELL WITHOUT RESERVOIR.

Prior to the Chicago Pneumatic Tool Company installing its compressed air water lift system the citizens of Des Plaines had no regular supply of water on

which to depend, 54,000 gallons being all that could be pumped in twenty-four hours.

The guarantee made by the contractors was to install a plant capable of raising 200,000 gallons of water in twenty-four hours. Under test they raised at the rate of 279,000 gallons for several days.

The outfit consists of one 12x12x14 Type G-S-S Franklin compressor, a 36-inch by 6-foot upright receiver, three Chicago Pneumatic Tool Company's special water lift valves and necessary piping, all of which was furnished and installed by the Chicago company. There are two 8-inch and one 6-inch wells, all three of which are about 110 feet deep.

Bids were submitted by the leading concerns engaged in the installation of compressed air water lift systems, and after due consideration the contract was awarded to the highest bidder.

FIREPROOFING AND INSURANCE.*

By Edward T. Cairns, Chicago, Ill.

In considering the so-called fireproof qualities of cement or concrete it will be well to fix in our minds at the outset the proper definition of the word "fireproof." In a technical sense there is, of course, no such thing as a strictly fireproof building—that is, a building which is absolutely proof against damage by fire. There are, however, many materials which are non-inflammable and capable of resisting or retarding a fire of ordinary intensity for a sufficient length of time to allow the extinguishment of the fire with nominal damage to the structure. Therefore a building properly constructed of such materials may be entitled to the nominal term fireproof, though as a matter of fact the strictly correct term would be fire resistive. Whether it is practical at this late day to make any such grammatical distinction of terms is doubtful,

TESTING WELL No. 1, DESPLAINES WATER PLANT.

*Committee report to the National Association of Cement Users.

so that perhaps it will be as well for us to recognize the old term "fireproof," notwithstanding its faults and the fact that in the past it has been the occasion of some misunderstanding and the cause of an over-confidence which has cost many a building owner dearly.

By cement in fireproof construction, of course, we mean generally the Portland cement which forms the vital element in monolithic concrete, either plain or reinforced, or concrete block construction, and since cement is always used in connection with the other materials making up concrete of some sort, we may as well use the term "concrete construction" in place of "cement construction."

That good concrete is a fireproof material in the above-defined sense is a well-established fact, as has been demonstrated in a limited way by tests in laboratory and field. Most of the laboratory trials have been made with small buildings, ten to fifteen feet square, heated to 1,700 or 1,800 degrees with wood or gas fires for two to three hours' time—a test which, while not calculated to demonstrate the ultimate fire resistance, is thought to approximate the ordinarily severe fire which may be expected in most kinds of buildings. Good concrete has successfully passed these tests, and the occasional failure of poor material under the same trial has taught some valuable lessons.

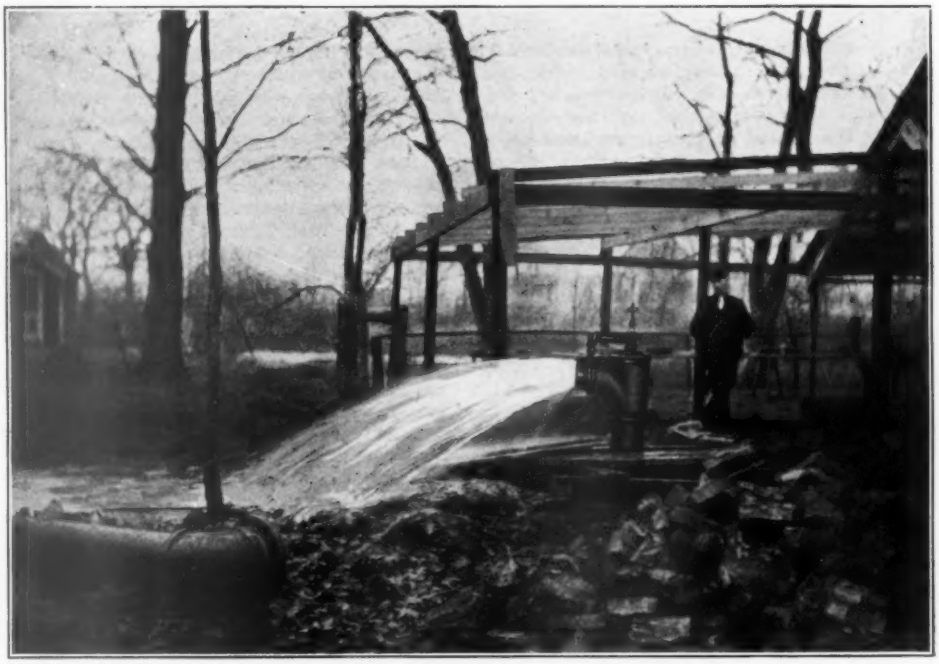
The field experience is more difficult to summarize. The first case in mind is generally the great Baltimore fire, in which were several small buildings involving more or less concrete construction, all of which came through the fire very well, though the conditions were somewhat favorable in that the fire in each individual building was of short duration and no water was played on the building while hot. The Iroquois Theater fire, in Chicago, was another case of a concrete building suffering very little damage, but in this case, also, the fire was of very short duration and the test therefore very mild. The Pacific Coast Borax Company, in Bayonne, N. J., suffered a severe fire about four years ago in a building all of concrete except the wooden roof. In this case the test was very severe in the upper part of the structure, and the damage to the concrete very trifling, a good test with remarkably good results. Other fires of less prominence have occurred with similar results.

Considering first reinforced concrete: In order to be fireproof in the accepted sense the concrete itself must possess two important qualities, viz: First, it must be capable of withstanding such disintegration or breaking as would either diminish its own strength or expose to fire the steel reinforcement, and, second, it must effectually insulate the imbedded steel reinforcement from the heat of a fire, even when not broken down.

There are several factors affecting the first of these requirements—the stone or other aggregate must not lose its strength or break or fly into pieces readily. In this particular there is doubtless some difference between the various aggregates commonly used, though we have only a limited amount of data bearing on this point. The National Fire Protection Association's committee on cement for building construction conducted a series of experiments a few months ago which afforded a comparison between limestone, gravel (which contained a considerable proportion of lime), granite and cinders. These tests showed practically no breaking or spalling of the concrete, but the conditions were favorable to such result in that the samples were rather small and were so arranged in the test furnace that throughout the test they were free to expand in all directions and the individual stones of the aggregates were of small size, not larger than three-fourths of an inch. Analysis of numerous tests by the New York Building Department, the British Fire Prevention Bureau and other sources also fails to reveal any decisive difference in fire resistance of various concretes, due to difference in the kind of aggregates in common use. The latest test of this which has come to our notice was made last October by the British Fire Prevention Bureau, which included simultaneous trial of seven small slabs of 1-2-3 concrete of different aggregates, described as slag, broken brick, coke breeze, furnace clinker, granite, burnt ballast and Thames ballast, the relative efficiency from high to low being about in the order named. Two of these, furnace clinker and Thames ballast, were quite deficient, but the others did not differ widely and the result was similar to that obtained in many other tests—that is, some small cracks developed, and in some cases the material was washed off by hose streams to a depth of an inch or so, but none of the slabs broke down.

It is the opinion of many that granite or any stone containing a relatively large percentage of water crystals is most objectionable, as it has a tendency to burst as the crystals are decomposed, this danger being obviously greatest where the individual stones are of a large size, and the use of such stone in concrete is therefore objectionable.

Limestone has been criticized as an aggregate on the ground that it is calcined



TESTING WELL No. 2, DESPLAINES WATER PLANT.

TESTING WELL NO. 3, DESPLAINES WATER PLANT.

or reduced to powder quickly under high temperature. It is true that it does lose its strength in this way more easily than most other stones, but this committee is of the opinion that the stone does not so weaken much, if any, before the cement which binds its units together, so its weakness is not really such an important matter as might at first appear. It is probable that trap rock, a hard, dense stone found in some Eastern States, or silicious gravel, or strictly clean clinker make the most desirable aggregate from the fireproof view point, though the latter, being practically unobtainable in sufficient quantities, makes a recommendation for its general use unwise.

The kind of sand, or its state of purity or sharpness, is thought to affect the fireproof qualities of concrete only as it affects the normal strength of the material, and therefore the factor of safety, upon which the endurance of the structure under fire largely depends.

It is very evident, of course, that the integrity of concrete under exposure to fire, as well as under normal conditions, depends primarily on the cement, which binds the mass together, and in this fact lies the most important inherent weakness of concrete as a fireproof material. As to the fireproof qualities of Portland cement itself, very little data appear to be available. The standard specifications adopted by the American Society for Testing Materials, the American Society of Civil Engineers and others do not touch on the point at all, possibly for the reason that some have assumed that cement, which meets the other requirements as to strength, soundness, etc., cannot vary much in fire resistance, and perhaps for the reason that a very large part of the cement for which these specifications were prepared is used in bridges, embankments, marine work, etc., where fire resistance is not a factor. Neither do the United States army engineers nor various foreign specifications cover the point, probably for the same reasons. Cements which conform to the standards above referred to cannot vary much in the proportion of their chief constituents, though some of the minor elements do vary considerably, and it is well known that there is quite a wide difference between various brands as to the quantity of water required for hydration, and it may be these differences, especially the latter, may have an important bearing on the first resistance. Various experiments now under way will doubtless settle the question within the next year or two, but for the present we must assume that all Portland cements conforming to the accepted standards in other respects are of equal fire resistance.

The statement so often made that cement is necessarily fireproof because in the course of its manufacture it has been burned in a kiln hotter than any burning building is not true, any more than is the same statement concerning hollow tile or other materials. They both appear in a building under radically different conditions than obtain in any sort of a kiln, the important difference in the case of the cement being that when mixed into a concrete it is combined in a crystalline form with water, which is a material very easily affected by heat. There is no occasion for discussing here the intricate question of the chemistry of cement. It is sufficient to say that the effect of heat is to dehydrate it or separate the water from the cement and thus reduce it to a condition resembling its original powdered state. The temperature at which this dehydration occurs is about 350 degrees F. —that is, the cement itself must reach that temperature—but concrete being a slow conductor of heat, any considerable mass of the material cannot absorb that amount of heat for some time after the temperature at its surface has reached the 350 degrees, or even a very much higher point; hence it is that in a burning building a temperature of 1,000 to 2,000 degrees may be applied suddenly to the surface of a concrete wall or floor, and the result will be an immediate dehydration of only a very thin film of cement at the surface and a very slow progression of dehydration into the interior of the mass. As above stated, this dehydrated or recalcined material does not necessarily fall away unless struck by a stream of water or other object, or unless the rupture of individual stones in the concrete throws it off, and so long as it remains in place it acts as a very efficient insulator for the remaining good concrete beneath, so that the penetration of heat into the mass and its consequent dehydration grow slower and slower. If by this process the cement loses its adhesive strength, of course the concrete is ruined, and in the case of walls or columns its crushing strength is reduced in the proportion that the dehydration of the cement has penetrated from the surface, and this is irrespective of the kind of aggregate used. The logical conclusion of the above is that, given a cement and aggregate of good quality, the fire resistance of a concrete wall or floor is entirely a question of the time of exposure and temperature of the fire.

Whatever the comparative value of va-

rious aggregates or cements may be, a far more important factor in the strength of concrete under fire, as well as under normal conditions, is the relative proportion of the materials and the method of combining them. The necessity of a dense, fairly rich concrete, practically free of voids, such as is produced by a wet mixture well tamped, is well known to all experienced users of the material, and the troubles occasioned by mixtures containing too little cement, or made too dry, or not properly tamped are perhaps too familiar to some of us. This feature has a direct bearing on the fire resistance of the structure, as a dense, rich mixture is much less liable to spalling and disintegration than a poor, porous concrete, and if the theory is correct that the dehydration of the cement itself, or the driving off of its water, is what weakens the mass, then the richer in cement the mixture is, and consequently the more water is contained in the mass, the longer the cement will last, because a longer time will be required to drive off the large amount of water. Furthermore, its factor of safety above the strength required for normal conditions is naturally much greater, and that has a most important bearing on the fire resistance feature. A structure so built that a considerable proportion of its ultimate strength may be destroyed by fire without causing a collapse, obviously has a much greater chance of escaping total loss than one which, though noninflammable, has no great strength above that required for normal conditions, and so would be subject to collapse on the failure of some one or two of its vital members. The abnormal strains to which a building is subject during a fire are always severe and often not to be determined in advance. The falling of heavy weights and internal stresses set up by rapid changes of temperature are severe trials to any building, and the structure that contains the greatest reserve strength above that required for ordinary demands is the safest. This, of course, refers to any type of construction as well as to concrete, and the disregard of this principle has in many cases cost dearly in case of fire. In the famous Baltimore conflagration the great weakness of tile and steel construction was along this very line; the tile was good enough for its normal uses, but was generally too thin and frail and too poorly secured in place to withstand the mechanical strains imposed by a severe fire.

As to the second general requirement of insulating quality of concrete for steel reinforcement, the importance of this function of the material is apparent when we remember that in practically all reinforced concrete construction the steel, of whatever style or system, is designed for the vital duty of carrying all the tensile strains of the structure, and in order to do this it must be placed as low as possible in the beam or slab; in fact, there is no reason, structurally, for more than barely covering the rods. It is well known that steel loses its strength very rapidly on exposure to fire, and steel of any form used as a reinforcement for concrete is no exception to the rule. According to "Kent," the tensile strength of steel at 670 degrees is only 75 per cent. of its ultimate strength under normal temperature; at 725 degrees, 60 per cent.; at 770 degrees, 50 per cent.; at 860 degrees, 40 per cent.; at 1,025 degrees, 30 per cent.; from which it is obvious that the reinforcement of a concrete floor, beam, slab, column or wall must have some very efficient insulating material between it and an ordinary fire if its strength is to be retained. It is well known that concrete is a very slow conductor of heat, but there are only a few exact data on the subject. The tests of the National Fire Protection Association committee above referred to were chiefly for the purpose of determining that point and showed that on an average of eleven samples rods imbedded to a depth of one inch in concrete reached a temperature of 670 degrees, where their strength is reduced 25 per cent., in fifty-nine minutes under average temperature of about 1,500 degrees at the surface of the samples.

This would appear to afford ample proof that one inch of concrete covering over steel reinforcement, or about steel I beams, is not sufficient for reliable fire protection. In many large buildings, particularly of mercantile or storage occupancy, temperatures of 1,800 to 2,000 degrees may prevail in portions of the structure for much more than an hour, in which case two inches or more of protection would be necessary to preserve sufficient strength in the steel to carry its load. This would be true even if all the concrete were certain to remain in place during a fire, and with the possibility of some of the material breaking off the extra thickness is doubly necessary. As to the relative value of the various kinds of aggregate as an insulator, none of the numerous tests referred to indicate a very wide difference, but such variation as does appear is in favor of the cinder aggregate and most unfavorable to the granite. Here, again, the superiority of a rich, dense concrete appears, as the tests indicate that as between rich, medium and lean mixtures, the richer mixtures were

appreciably slower conductors of heat than the lean ones.

The fire resistance of concrete blocks for wall construction has been the subject of much anxious inquiry for some months past. The question is being investigated by several interests, but probably most exhaustively at the Structural Materials Testing Laboratory of St. Louis by your president, Mr. Richard L. Humphrey, under the auspices of a general advisory board composed of representatives of a large number of engineering bodies, including this association and government officials. The results of this and other investigations, of course, cannot be foretold by this committee, and the actual field experience with this construction thus far is too limited to afford a basis for positive conclusions. However, we are confident that most of the foregoing statements on the subject of concrete in general are applicable to small blocks of the same materials. The form in which most of these small blocks are made involves a certain weakness under severe temperatures, which, while by no means fatal to the fire resistance places a limitation on that quality which must be recognized, viz.: It is subject to breakage by unequal expansion under heat, the same as is hollow tile or any other similar hollow material. Hollow blocks of concrete or tile as set in the walls or floors of a building usually present only one surface to the direct attack of fire, and the consequence is that that side or face of the block expands readily and irresistibly under the influence of the heat, while the other three sides, receiving much less heat, do not expand nearly as rapidly, with the result that the hottest side breaks away from the others. This has been demonstrated in actual fires and experimental tests for both concrete and tile. Failure from this cause would naturally occur soonest in blocks having a thin shell, inasmuch as the thinner the shell of the block toward the fire the more quickly it will heat through and consequently expand. Therefore, if you would have a block stand a hot fire, make the webs thick.

This breaking by unequal expansion has sometimes been referred to as a bursting due to pressure of steam or gases generated in the large hollow space or cell of the block, but a very brief analysis of the conditions will easily disprove any such statement. In the first place, there is generally no means of getting water into the interior of a block and no probability of gases from other sources being introduced therein, but if it were possible to get gas or steam into the interior space these cells are so continuous in a wall or floor, and have so many vents to the atmosphere at the top of the wall or through mortar joints, that the accumulation of the number of pounds pressure (estimated at 25 to 50 pounds) necessary to burst an ordinary small block would be an impossibility under working conditions. In connection with blocks we may repeat that, as in the case of monolithic concrete, good materials, plenty of cement, careful curing and, above all, intelligent workmanship, produce the most fireproof result.

To sum up this matter of fire resistance of concrete, we may repeat that while, like all other building materials, it has its limitations, it occupies, and will continue to occupy, an increasingly important position in the field of fire resistance construction, and when intelligently used under proper conditions may be relied on to resist such fires as any ordinary building may be expected to experience. Such intelligent use will involve the selection of good materials, will provide for the correct and uniform proportioning of them, the thorough mixing by good machinery, adequate thickness of insulation of steel, guarding against freezing and, in the case of blocks, proper curing and thickness of shell—in short, all the requisites of a building safe and strong under normal conditions with a liberal factor of safety. It may be safely assumed that concrete which is the richest, strongest and most durable under normal conditions will develop the highest fire resistance.

The relation of fire insurance to concrete construction is important to insurance companies and builders alike. The attitude of the companies toward concrete up to this time has been, like that of other interests, necessarily one of inquiry and investigation largely. They have felt that this type of construction was in an experimental stage, acknowledged as peculiarly subject to abuse by incompetent users, and have naturally been somewhat cautious in indorsing it as fully as its advocates would like. They are now recognizing, however, that the matter is rapidly approaching a settled and known basis in the building world, and they are at the present time according it more recognition in their underwriting than ever before. Insurance companies are the most earnest advocates of improved construction, and are constantly urging the adoption of the best known methods and materials for building. They are investigating the whole concrete subject through

the National Fire Protection Association and other channels, and there need be no doubt that concrete construction will be given full credit in fire insurance rates and classifications for all its good qualities as soon as its record is established. In the meantime they are giving very liberal credit to so-called fireproof buildings of concrete construction, practically the same as is allowed for other types as a rule. They are not, however, recognizing concrete blocks as the equivalent of good brick, for the reason that such experience as they have had in laboratory and field does not warrant it. This is no doubt due partly, if not chiefly, to the fact familiar to us all, that a large proportion of the blocks made up to this time have been of an inferior grade, made without due regard to the known requirements of a good product, and in the matter of insurance rates, as in other respects, good material has been made to suffer for the failings of the too large proportion of poor.

In closing we cannot too strongly emphasize the fact that the position concrete is to occupy in the art of fireproof construction will depend very largely on the degree of intelligence and honesty of its users. It has had something of a fight to attain its present position. It is not a new proposition. For years it has been known and for as many years has been criticised as being peculiarly subject to abuse by incompetent contractors, a criticism which we must admit is altogether too well founded, and for which some of its most ardent advocates are partly responsible. There will always be more or less such criticism, but it can be largely overcome and the art maintained on a sound basis by the intelligent and persistent following of sound engineering principles and good workmanship on the part of its advocates.

The time has not yet arrived for adopting a detailed standard for fireproof concrete construction, but we would commend to you a few fundamental principles which were laid down by the National Fire Protection Association in its last report as essential to the best results, viz.:

First—The work should invariably be designed and its entire erection supervised personally by engineers of skill and experience in this particular line.

Second—Concrete for fireproof construction should be composed of high-grade, tested Portland cement, clean sand and broken stone, gravel, slag or cinders, so proportioned that the cement will completely fill all the voids in the sand, and the mortar thus formed will a little more than fill the voids in the aggregate.

Third—The materials should be well mixed by machine, with enough water to make a distinctly "wet mixture," and should be tamped down so that no voids are left.

Fourth—All steel members, of whatever style, should be imbedded at least two inches in the concrete, and, in the case of important load-carrying members, three inches.

Fifth—No cement work of any kind should be laid in cold weather without being safely guarded against freezing.

EDITORIAL COMMENT

Municipal Gas Works.

State Supervision of Sanitary Matters.

Formulae for Strength of Concrete Beams.

MUNICIPAL GAS WORKS.

The *Gas World* of London, England, has published a valuable book made up of tables showing the results of operation of 113 gas works in England, and the effect of municipal ownership upon prices. The tables go into great detail, showing the total amounts and amounts per ton of coal of gas made, sold, unaccounted for, coke, tar, ammonia; the data as to consumers, public and private, and prices; expenditures for dividends, sinking fund, etc., with surplusses and deficits; receipts from gas, and meter and stove rentals, residual products and miscellaneous; manufacturing charges, for coal, purification, salaries, wages, maintenance; gross and not cost less residuals sold; taxes; distribution charges, salaries, and maintenance of pipes, meters and stoves; management charges, for directors and auditors, salaries, collection, stationery, printing, etc.; bad debts; information about capital, book value of plant and amount of reserve.

It is possible from these tables to study the economy of any plant or group of plants and to compare with the results of operation in this country. The net cost of gas in holders after receipts for individuals have been deducted, ranges from 22.57 pence (45.82 cents) per 1,000 cubic feet of gas sold to 5.17 pence (10.5 cents). About 25 cents of this difference is due to difference in cost of manufacture, the remainder being due to less receipts from sale of residuals. There is a very material difference in the amounts of residuals produced and sold, although the two plants are very nearly equal in capacity. The price of gas in the plants corresponds with the cost of manufacture, being 3s 6d (95.2 cents) in the first and 1s 3d (30.4 cents) average in the second. The cost of manufacture is greater in the first plant also because coal costs nearly 6 shillings ($1.44) a ton more. The difference in cost of coal and receipts for residuals act to make the net cost of coal less residuals in the first case 12.59 pence (29 cents) per 1,000 cubic feet of gas and in the second case to make the residuals pay the cost of coal and 0.1d (0.2 cent) more per 1,000 cubic feet of gas sold. Cost of purification and cost of maintenance are also much less in the second plant. The capital in the first case is three times that in the second, and the book value of the undertaking is more than four times as great. The reserve in the second plant is, however, 32.5 per cent. of the capital as against 4 per cent. for the first.

These figures show the effect of local circumstances, management and amount of capitalization upon the cost of gas and the price at which it can be sold, and the figures are, as indicated, sufficiently detailed to show the reasons for the differences. The discussions of municipal ownership of gas plants in this country have not had any such mass of figures as are given in these tables as basis and the results of operations have been made to prove almost anything according to the bias of the one analyzing them. It is undoubtedly true that a plant can be successful under a rate in one city which would be impossible in another, even with all factors the same except cost of materials and receipts for residuals. Cost of plant, especially of piping systems, also varies greatly. Like variations will be found throughout. The conclusion is inevitable that the problem of gas cost is largely a local one which must be carefully estimated before prices are fixed. The conclusion from the majority of the figures in the table referred to is that municipal ownership is a success in England if judged even from the single item of reasonable cost of gas. The agitation of the question can do only good, either in bringing about municipal ownership or in reducing prices for gas to a closer approximation to cost.

STATE SUPERVISION OF SANITARY MATTERS.

There has been considerable development within the past five years in the line of state control of matters pertaining to the public health, more particularly in regard to technical features of water supply, sewerage, sewage disposal, stream pollution and drainage. Much of this has shown itself in the elaboration of systems in states which had already made some progress in this line. The complications

which have arisen present some lessons which it will be well for other states to heed.

New Jersey is perhaps the most fully supplied with commissions having in charge health matters and construction of works required for improving conditions. In addition to the state board of health there are the new state potable water commission, the state sewerage commission, the Passaic valley sewerage commission, and such commissions as that formed under the law to construct and assess the cost of sewers for a number of municipal corporations about the city of Newark. A joint commission with New York upon the pollution of New York bay is also proposed.

In Massachusetts the number of such commissions is practically reduced to the state board of health for general matters and the metropolitan sewer and water boards for construction and assessment of cost of works involving a number of separate bodies.

Some study of the character of the work which must be done by these commissions should be made and would tend to reduce the number of commissions and to prevent duplication of work. The earliest appearance of state control of sanitary matters is usually made through the state board of health, whose general duties do not ordinarily cover any material amount of engineering design or construction. When the pollution of streams causes trouble with water supplies the engineering questions begin to come in. They enter the problems of the state board of health and it is therefore natural that their study and control should be assumed by or assigned to that body. If the board has been entirely a body of physicians, taken up with the study of problems of hygiene, the result may not be satisfactory. There is a material difference between the study of the effects of unsanitary conditions upon the human animal and their removal, and the study of the effects of polluting materials upon water, soils and air and methods of designing and constructing works for correcting the errors that have been made. The first set of problems belongs to the sanitary expert, whose education has largely been that of the physician. The second set of problems belongs to the engineer whose education has been in practical sanitary lines. It is unfortunate, therefore, if the entrance of these engineering problems is not followed by the revision of the board to bring in the new aid that is necessary. In Massachusetts this is done by putting engineers on the state board of health and employing a force of competent engineers. In New Jersey there seems to be an attempt to form a new board to take up each new set of problems, and it is supposed that these boards and their employes are selected with reference to their special fitness for attacking these special problems. The commissions are sometimes made up from other state boards. Thus the new state potable water commission is made up of the state riparian commission and the state geologist, who have had more or less to do in an official way with public water supplies for some years. It is almost inevitable that such numerous commissions should duplicate work and should do needless experimental work, as well as conflict with each other when their fields overlap.

A still further division may be made in the classification of commissions according to the kind of work they do, and possibly the three classes of hygienic problems, sanitary problems and engineering design and construction may cover all those under consideration if these terms are understood.

The first class is that belonging to educated physicians, as already stated. The second class may be restricted to the general problems whose principles and general plans must be worked out by men who are versed in all lines of sanitary work, men who, while properly engineers in their training or their tendencies have become familiar with the problems both of engineering and of hygiene. The third class will then include the strictly engineering problems of design and construction.

In Massachusetts both the first and second class of problems fall to the state board of health. The third class fall to such bodies as the metropolitan sewerage and water commissions. In New Jersey the first set of problems fall to the state board of health. The second set are distributed among the potable water and sewerage commissions, and the third set fall to the local commissions, corresponding in principle to the metropolitan sewerage commission in Massachusetts. Such bodies as the Passaic valley sewerage commission seem to have problems of both the second and third sets in charge.

In states like Indiana it is not possible to create new state officers without amendments to the constitution. The only method of procedure in such states is to so constitute the state board of health that it can cope with all three classes of problems if necessary.

It seems to the outsider that the states of New Jersey and New York are multiplying their commissions unnecessarily

and are so constituting them that their fields will overlap and produce waste if not positive friction. There may be some plan in the procedure but it does not appear definitely.

Concentration under well-constituted controlling bodies is almost always conducive to economy and efficiency and it seems probable that the first two sets of problems would be best handled by a single board in which physicians, sanitarians and engineers are represented. The problems of detailed design and construction are so different and so often purely local that they may usually be referred to boards or officials more temporary in their nature and restricted in their fields of operation. This works well in so small a state as Massachusetts, and would probably be much more satisfactory in so large a state as New York than a commission or a series of commissions having the whole state in charge.

Occasionally temporary boards may be valuable for the study of special problems, as we have boards of consulting engineers on great works, but they should work in conjunction with and report to the central state board of control, under whatever name it may pass, and the boards of control of construction should be formed for the localities in which the construction is to be done, under the provisions of laws governing the practical carrying out of the recommendations of the central board, and should have as close official connection with the central body as is necessary to insure due attention to the general plan and proper carrying out of details.

What is forced under the law of Indiana will probably be most satisfactory in the state of New Jersey or New York.

FORMULAE FOR STRENGTH OF CONCRETE BEAMS.

The inquiries for methods of designing reinforced concrete beams have been numerous, there being but little as yet available in digested form for convenient use in the drafting room. This condition is due to the meager supply of data on which to base theories of design, the large number of formulae which have been developed from the data available, and a consequent suspicion of the general adaptability of any of the formulae. A collection of the more important formulae developed in this country was given without explanation in MUNICIPAL ENGINEERING, vol. xxix, p. 347, to show the variations in form and in results from using the various forms. The differences in form and in theory are largely due to the differences in results obtained from experiments, these differences being due to differences in materials, in proportions of concrete and steel, in proportions of ingredients of concrete, in methods of manipulation, in assumptions as to joint action of materials, etc. It is true, therefore, that a given formula fits the experiments upon which it is based more closely than any other formula and that a formula developed for one set of conditions will not answer for use under other conditions. Great caution must therefore be exercised in applying a formula far outside the limits of the conditions for the experiments on which it is based.

A valuable discussion of the various formulae, which serves to show the basis upon which they are founded and their limitations, has been made by Mr. Henry Goldmark in a paper before the Canadian Society of Civil Engineers, and those who are interested in this class of design will do well to study it carefully.

The variations of modulus of elasticity in various concretes, due to differences in construction, are emphasized, and the difficulty on this account of making a general formula, applying to all loadings is clearly stated. The effect of the maximum load can be shown, however, and the formulae are therefore given for breaking loads, the assumption of a factor of safety being left to the engineer, who knows the materials with which he must work and the workmanship he is likely to secure.

Most formulae are based on the assumption that the steel takes all the tensile stress, but few assuming that any of it is carried by the concrete, though, when well made and placed an appreciable proportion is undoubtedly so carried.

Mr. Goldmark develops a general formula on the usual assumptions of a rectangular beam, loaded vertically and reinforced on the tension side only, that there is no initial stress in either concrete or steel, that the steel and concrete act together, without separation, and that plane sections before bending are therefore plane after bending. He then makes in turn the assumption of various authors and develops their formulae for the general assumptions above, showing their likenesses and differences. This method of comparing the formulae shows that they generally agree quite closely in form. The constants differ because of the differences in conditions of tests on which their determination was based. The results obtained by using the formulae in making designs agree quite satisfactorily when the differences in assumptions and in constants are taken into consideration. This method of comparing the formulae makes it possible

to allow for these differences and to choose the formulae best suited for the conditions of a design.

The formulae thus compared are Thacher's, Sewall's, Von Emperger's, Wentworth's, Hennebique's, Considere's, Johnson's, Hatt's, Condron's, and Talbot's. Mr. Goldmark also fits his formula for easy computation. Such of these formulae as did not appear in the collection in vol. xxiv referred to will be found in the Question Department of this number.

THE QUESTION DEPARTMENT

FILTER FOR SMALL RESERVOIR.

Can you give me information in regard to the construction of the best kind of filter for the filtration of water in a small reservoir? E. C. C., Lenox, Mass.

The question is too indefinite to warrant a definite answer. Many small reservoirs on mountain streams draining unpolluted areas do not need filters, but merely screens, some forms of which are miscalled filters. Frequently all that is necessary is a set of perforated copper or steel plates or wire screens with comparatively large openings. In other cases the screens must be quite fine. During certain seasons of the year many small reservoirs have growths of algae which will get through the screens and cause trouble, and nearly all are troubled occasionally with roily water from floods. It is quite common to insert as a part of the screening apparatus, baskets containing sponges, charcoal or other fine material which will arrest the passage of the fine clay or other inorganic sediment and the fine particles of algae, dead or alive, and other similar organic matter. These baskets are usually rectangular in form and slide into recesses in the gate chamber between the metallic screens mentioned, or may even take their place entirely. The use of the term filters in connection with them is entirely wrong and gives a sense of security from contamination which has no warrant whatever. Indeed, these forms of screen are not described in the standard books, because they are safely applicable to so small a number of water supplies. The smaller towns in hilly or mountainous districts of small population can, however, use them on water supplies obtained from mountain brooks. The screens should be cleaned frequently and the screening materials should be renewed almost as frequently.

If there is any suspicion of pollution of the water from dangerous sources, these screens will be no protection and a thorough filtration will be necessary. This is the more important since the amount of water to be polluted is small in comparison with the effect of even a single source of pronounced pollution. Sand filters must then be considered and of the two forms, slow sand filtration and mechanical filtration, it is probable that the latter will be found most economical.

In the particular case of our correspondent there is no information regarding the danger of pollution of the supply and there are no data to determine what form of apparatus is necessary between the limits of a coarse wire screen and a separate sand filtration plant located below the outlet from the reservoir.

Goodell's "Water Works for Small Towns" ($3) and Turneaure's "Public Water Supplies" ($5) give data and reproductions of drawings which will be of great value in the study of the question.

DISTRIBUTION OF WATER BY COMPRESSED AIR.

Will an automatic system where the water is pumped in at the bottom and compresses the air be practicable? Do you think the tank will stand the pressure? R. F. C., Sioux Falls, S. D.

An air-tight steel tank can be used to give pressure to a small water distribution system, by pumping water into the tank and compressing the air already there. The amount of pressure the tank will stand depends upon its design, the thickness of the shell, the design of the riveting and connections and the ultimate

strength of the steel. The makers of steel tanks can be depended upon to furnish tanks which are safe within the limits of ordinary practice, but tanks for special pressures or special purposes should be specially designed.

SEWAGE DISPOSAL IN SEPTIC TANKS.

Can you inform me in regard to the workings of what are termed septic and reduction tanks for the disposal of sewage and how they are made and the approximate cost of the same? Also would it be cheaper, where a city has several trunk sewers to gather them all into one, if it is practicable, than to have several different tanks? A. B. C.,
Binghamton, N. Y.

Septic tanks are simply tanks, usually at or below the level of the ground, made of brick, stone or concrete, of length and breadth and number to suit the maximum amount of sewage to be treated. The depth of tank may also be varied to some extent but is usually such that the depth of sewage standing in it is say from five to ten feet. In many American examples the tanks are covered, but this is not always considered necessary, especially in the southern states.

The cost evidently depends upon the size and the special conditions of excavation of earth, cost of materials, necessity of roofing, etc., and no figures can be given which will be of any particular value.

It is quite possible that tanks located at or near the outlets of the various trunk sewers would be cheaper than a collection of tanks at a common outlet, when the cost of the connecting intercepting sewer is considered. This is a question which can be answered only by an engineer who has full surveys from which to make close estimates.

Rafter's "Treatment of Septic Sewage" (50 cents) gives in brief and clear style much information on the subject of the questions asked and can be read with much profit. The following are some figures of cost from this book: A septic tank of 5,300 gallons capacity, serving 1,500 people, cost $3,400; a septic tank and single filtration beds for 2,101 population cost $13,000. English figures range from $40 to $119 per thousand gallons of sewage treated per day.

It may not be necessary to treat the storm water, in which case the works can be built of a capacity say two or three times that required for the ordinary flow of sewage and this amount intercepted from the trunk sewer and passed through the septic tanks. It may also not be necessary to use the filter beds mentioned in one of the cases above. The size of works and cost would be reduced to a minimum in such cases.

ORDINANCES REGULATING DOGS.

Can you give some sample methods of treating the stray dog question in use in the larger cities? H. C. R., ——, Ind.

The ordinances for Kansas City and Cincinnati are at hand.

In Kansas City the ordinances require:

1. The registry of all dogs and that they shall wear collars and tags.
2. Registry fees of $1 and $3.
3. New licenses each June 1.
4. That dogs not wearing registry tags shall be taken up and killed at the end of three days if not called for.
5. That removing tag is an offense.
6. Prohibition of dangerous dogs unless chained.
7. Prohibition of habitually noisy dogs.
8. Muzzling on mayor's proclamation.
9. Prohibition of certain dogs running at large at certain periods whether tagged or not.
10. Harborer of dog to be responsible for it.
11. Country dogs to remain with master in city if not tagged.
12. Fine of $5 to $500 for failure to register every dog harbored.
13, 14, 15, 16. Provisions regarding other animals.
17. Public pound to be provided.
18. Record of all transactions.
19. Reports and remittances to treasurer every three months.
20. Appointment of dog enumerator and public impounder by mayor with consent of upper house.
21. Bond for $2,500.
22. Enumeration of dogs and service of notice to register and record of same.
23. One assistant at pound at $25 a month and others outside at $2 a day.
24. Registry of assistant commissioners with city clerk.
25. Badges to be worn when on duty.
26. Penalties for assistants' failure to take out their commissions.
27. Fees for the office, 20 per cent. of receipts, not to exceed $1,500 a year, to be paid as other salaries are paid.
28. Misdemeanor to obstruct enumerator and impounder or assistants.
29. Assistance of police on demand.
30. Fines of $5 to $500 for failure to comply with or violation of provisions of ordinance.

The Cincinnati ordinance is similar in its requirements of registry of dogs, wearing of collars and tags, records, etc. The year begins September 1 and fee is

$1 a year. Any police or peace officer may arrest tagless dogs and deliver them to the public pound or place approved by the mayor. Such dogs may be redeemed within 72 hours on payment of $2, and if not redeemed shall be sold or killed if not salable. The mayor may issue muzzling orders when he deems them necessary. Interference with officers is punishable by fine up to $100. The ordinance does not apply to dogs of non-residents passing through nor to dog shows.

The section providing for taking up and disposing of dogs reads as follows:

"The Board of Public Service of the city may, after advertisement for bids, in accordance with law, contract with any person, association or corporation, presenting the lowest and best bid for the capture, impoundage and disposition of all dogs running at large contrary to the provisions of this ordinance, and for the maintenance and shelter of lost, strayed or harmless dogs; provided, however, that the compensation to be paid to such person, association or corporation by such contract shall not exceed, in any year, the amount collected by the city from the payment of the fees hereinbefore provided for during the current year for which such contract is made. The Board of Public Service may prescribe in the contract the manner in which the work is to be done and in which payments are to be made to the city thereunder. When such contract is made all dogs thereafter captured or seized under the provisions of section 7 of this ordinance shall be delivered to the contractor, to be held or disposed of in accordance with such contract."

In the former city the responsibility of the operation of the ordinance is assumed by the city and the city receives the benefit if there is an excess of receipts over expenditures, but there is an almost unchecked opportunity to employ an indefinite number of assistants, whose duties are light and whose qualifications need not be excessive, thus making these offices excellent places with which to pay political debts.

In the latter city the whole thing is farmed out and is practically out of the control of the city officials. In the hands of an unscrupulous contractor there is an opportunity for undue profits both from the possible excess of legitimate receipts over expenditures and from crafty manipulation of valuable dogs not registered and the removal of tags from properly licensed animals. Neither ordinance is entirely satisfactory, but the Kansas City ordinance will probably be generally considered the better. Can our readers give examples of better forms and reports of their operation?

CITIES HAVING SMOKE PREVENTION ORDINANCES.

Please give me a list of the cities having ordinances regulating the making of smoke. E. N. Wood, Chicago, Ill.

The following are the cities having smoke prevention ordinances: Allegheny, Pa., Auburn, N. Y., Baltimore, Md., Birmingham, Ala., Boston, Mass., Brooklyn, N. Y., Buffalo, N. Y., Chicago, Ill., Cincinnati, O., Cleveland, O., Denver, Col., Detroit, Mich., Grand Rapids, Mich., Hamilton, Ont., Indianapolis, Ind., Milwaukee, Wis., Minneapolis, Minn.; Montreal, Que., New York, N. Y., Philadelphia, Pa., Pittsburg, Pa., Providence, R. I., Reading, Pa., Rochester, N. Y., St. Louis, Mo., Springfield, Ill., Springfield, Mass., Syracuse, N. Y., Toledo, O., Toronto, Ont., Washington, D. C., Wilmington, Del.

DEPOSITS OF ASPHALT IN THE UNITED STATES.

Are there any native solid bitumens as distinguished from residual pitches on the domestic market in sufficient quantities for paving purposes? W. C., ———.

The deposits of solid bitumens in the United States are very limited in number, when the bituminous rock and sand deposits are eliminated from the consideration as this question apparently intends. A deposit of Grahamite in West Virginia was mined some years ago, but the mines have been abandoned, probably because exhausted so far as practical use is concerned. There are a few occurrences of veins of asphalt in Indian Territory, but they have not yet reached the market in quantities sufficient for use in paving operations. The same is true in Colorado. In Utah there are a number of workable seams of uintahite, known commercially as gilsonite, and of some other forms of asphalt not suitable for paving. The gilsonite is on the market and is at the present time controlled by one organization, the mines being at some distance from the railroad and this organization being the only one at present equipped with facilities for shipping or in possession of developed mines. California contains some deposits of native solid bitumens which have served as sources of supply for asphalt for paving, which have been under the control of the same organization in the past and were practically abandoned for some years.

There are bituminous sandstones, limestones, shales and sands and liquid as-

phalts in several states from Kentucky to California and there are now on the market several brands of asphalt made from California, Texas and Indiana petroleums with asphalt bases, but the above named are the only natural solid bitumens likely to be available for paving purposes which are known to the writer.

INFORMATION ABOUT PAVING MATERIALS.

I wish to ask for some information on the line of paving for municipal streets. I wish to prepare practical data on the different materials, cost of construction, workmanship, etc., on the following paving materials: macadam, creosoted wood block, granite block, brick, asphalt, bitulithic, rock asphalt. It is my desire for you to advise me the best way that I can obtain such information of recent date. If there is any best book by a modern author with practical data giving such information, I shall be pleased to have it. Also and most important is to know the present asphalt mixture adopted by the asphalt paving companies according the requirement of city specifications, and proportion of the different ingredients of the asphalt mixture.

A. R. D.,
Chicago, Ill.

The best books on the subjects named are Baker's "Roads and Pavements" ($5), Tillson's "Pavements and Paving Materials" ($5), Byrne's "Highway Construction" ($5), Richardson's "Modern Asphalt Pavement" ($3). These books are the latest and will give full information about macadam, granite block, brick, asphalt and rock asphalt as paving. The back numbers of MUNICIPAL ENGINEERING are equally good sources of information about these materials and are the only sources of full information about creosoted wood block, brick and bitulithic pavements. Specifications for bitulithic will be found in vol. xxv, p. 325; vol xxiv, p. 115; and vol. xxi, p. 40, and there are several articles concerning the pavement and methods of construction in each volume for the past three or four years. See vol. xxv, p. 171; vol. xxiv, p. 270, and vol. xxviii, p. 447, for general discussions. For articles on wooden blocks for paving see vol. xxvii, pp. 351 and 110; vol. xxv, pp. 314, 328 and 333; vol. xxi, p. 153, and a full list of articles in vol. xxvii, p. 23.

Following are the requirements for asphalt for paving in use in Indianapolis:

4. Asphalt.—The refined asphalt for use in the manufacture of the asphaltic cement for the preparation of the standard paving mixture shall be obtained from the crude natural material, and shall be in all respects satisfactory to the city civil engineer. To accomplish this, the crude asphalt must be specially refined, free from water, and brought to a uniform standard of purity, quality, and specific gravity; and, after having been so refined, it shall contain not less than 55 per cent. of bitumen, soluble in carbon bisulphide, and not less than 60 per cent. soluble in boiling Pennsylvania petroleum naphtha (boiling points 40 degrees to 60 degrees Centigrade); it shall have a specific gravity of not more than 1.38, and shall be free from all manner and form of adulteration. After the evaporation of the solvent, the pure bituminous matter soluble in carbon bisulphide shall be adhesive, malleable, and ductile at temperatures ranging from 70 degrees Fahrenheit to its liquefying point.

The above properties shall be considered standard, but any asphalt with properties differing somewhat from the above may be used if satisfactory to the city civil engineer, and approved by the board of public works.

5. Heavy Petroleum Oil.—The oil used in the manufacture of asphaltic cement hereinafter described shall be a petroleum from which the lighter oils have been removed by distillation until the oil has a specific gravity of from 18 degrees to 22 degrees Beaume; its flash point shall not be less than 300 degrees Fahrenheit in a New York State closed oil tester; fire test not less than 350 degrees Fahrenheit; it shall contain no appreciable amount of light oils or matter volatile under 250 degrees Fahrenheit., and shall be free from foreign matter and coke.

Liquid asphalt, maltha, or any other softening agent fulfilling the above tests and approved by the city civil engineer, may be used in place of heavy petroleum oil.

6. Asphaltic Cement.—Asphaltic cement shall be prepared from refined asphalt by fluxing with heavy petroleum oil, at a temperature between 250 degrees and 350 degrees Fahrenheit, and shall be of composition and consistency satisfactory to the city civil engineer. The proportions will vary according to the respective viscosity of asphalt and oil between the limits of 10 and 21 pounds of oil per 100 pounds of refined asphalt.

As soon as the flux is added the entire mass shall be agitated by an airblast or other suitable appliance, and the agitation continued until a homogeneous cement is produced.

The asphaltic cement must never be heated to a temperature exceeding 350 degrees Fahrenheit.

The contractor shall provide suitable and approved appliances for the proper preparation of the materials. Samples of asphaltic cement and of the flux shall be supplied to the city civil engineer or

other agent of the Board of Public Works, when required, in suitable tin boxes and cans, and said agents shall have access to all branches of the work at any time. Should it be determined by experience that the asphaltic cement, as submitted, does not produce a satisfactory pavement, its proportions and the manner of manipulation shall be changed and corrected to meet the approval of the city civil engineer.

7. Sand.—The sand used shall be hard grained, moderately sharp, fine river or lake sand, perfectly clean. Fifteen per cent. of it shall pass through an 80-mesh screen, and all of it shall pass through a 10-mesh screen.

8. Pulverized Carbonate of Lime.—The pulverized carbonate of lime shall be of such a degree of fineness that the whole of it will pass through a 26-mesh screen, and 85 per cent. shall pass through a 100-mesh screen.

9. Mixture of Materials.—The wearing surface of the pavement shall be composed of the above materials mixed in the following proportions by weight:

	Per Cent.
Asphaltic cement	9 to 16
Sand	88 to 74
Pulverized carbonate of lime	3 to 10

The exact proportions of materials used, within these limits, will depend upon the character and the location, grade and traffic of the street.

The sand and asphaltic cement shall be heated to about 300 degrees Fahrenheit. The pulverized carbonate of lime, while cold, shall be mixed with the hot sand and in the required proportions, and then mixed with the asphaltic cement, at the required temperature and in the proper proportion, in a suitable apparatus, so as to effect a thoroughly homogeneous mixture.

It is expressly understood that the contractor is, under any and all circumstances, responsible for the condition of the pavement during construction, and during the guarantee period, but this shall not relieve the contractor of any responsibility to so carry on his work and to construct the pavement so as to meet the approval of the city civil engineer, acting as the agent of the Board of Public Works.

12. Rock Asphalt.—Should any of the rock asphalts be used, the material shall be a bituminous limestone or bituminous sandstone, or a mixture of the two, and shall be prepared and laid in the following manner:

The lumps of rock, after being mixed in the proper proportions, shall be finely crushed and pulverized, and the powder shall be passed through a 20-mesh sieve. The powder shall contain from 9 to 12 per cent. of natural bitumen. In case of the use of any asphaltic limestone, or of a mixture of an asphaltic limestone and an asphaltic sandstone, nothing whatever shall be added to or taken from the powder obtained by grinding the natural bituminous rock. In case of the use of asphaltic sandstone only, the consistency of which being such as would prove too soft to sustain traffic, the material being otherwise satisfactory, it may be combined with pulverized carbonate of lime and asphaltic cement, in such manner and in such proportions as may be satisfactory to the city civil engineer.

This powder shall be heated in suitable apparatus to 200 degrees to 250 degrees Fahrenheit. It must be brought to the ground at a temperature not less than 180 degrees Fahrenheit, in carts or wagons made for the purpose, and then carefully spread with rakes on the concrete foundation as specified for refined asphalt pavement to such a depth that after having received its ultimate compression it will have a thickness of 2½ inches. The surface shall be rendered perfectly even by tamping, smoothing and rolling with heated appliances of approved design; after this a small amount of hydraulic cement will be swept over it, and it will then be thoroughly compressed by a steam roller weighing not less than five tons. No binder course will be used with rock asphalt for original construction, but for resurfacing old asphalt pavements it shall be laid on a 1-inch binder course as described above and as specified under "Resurfacing Asphalt Pavements," "Form BB." The net thickness of the rock asphalt, after compression, will in this case be 2 inches.

13. General Requirements.—The asphalt used under this contract shall be one agreeing in composition and properties with that described above, or one having composition and properties which shall be considered and accepted as equivalent or superior thereto by the board of public works and city civil engineer; but whatever may be the character of the asphalt used, or the manner of manipulation and laying, the pavement obtained must be equal to the best asphalt pavement laid, of the kind, and the guarantee shall not relieve the contractor from furnishing a pavement which, when completed, will not become so pliant in hot weather as to make it unsuitable for practical use, nor so unyielding as to crack and cause disintegration in cold weather, but which will have a good smooth sur-

face, suitable at all times for the various demands of ordinary traffic.

15. Kind of Asphalt.—The kind of asphalt which the contractor purposes to use shall be stated in the bid. Whenever so requested, the contractor shall submit to the Board of Public Works or city civil engineer samples of asphalt or other materials used, or which he proposes to use, in the execution of his contract.

Should any bidder submit a proposition which contemplates the use of materials differing somewhat from those specified above, he shall state specifically in connection with his bid what he proposes to use.

WHERE TO GET WADDELL'S CONTRACTS AND SPECIFICATIONS.

Will you kindly inform me where I can obtain single copies of Mr. J. A. Waddell's lectures on "Engineering Contracts" and "Specifications?" These lectures were mentioned in an abstract published on page 223 of the March number of the MUNICIPAL ENGINEERING magazine for this year. FRANK S. PACKARD, JR.,
Ann Arbor, Mich.

A similar inquiry is made by Thos. Griswold, Jr., Midland, Mich.

As stated in the abstract referred to, Mr. Waddell has printed the lecture, the full title of which is "Engineering Contracts," for distribution to the students who heard it. He doubtless has some additional copies for outside distribution. His address is J. A. L. Waddell, of Waddell & Hedrick, Kansas City, Mo.

CITIES OWNING THEIR ELECTRIC LIGHTING PLANTS.

Will you kindly give us a list of the cities of the United States that own their lighting plants? S. AND W.,
Boston, Mass.

Bulletin No. 20 of the United States Census gives the following names of cities of more than 25,000 population which own electric-light plants: Chicago, Ill.; Detroit, Mich.; Allegheny, Pa.; Columbus, O.; St. Joseph, Mo.; Grand Rapids, Mich.; Nashville, Tenn.; Tacoma, Wash.; Little Rock, Ark.; Wheeling, W. Va.; Topeka, Kan.; Springfield, Ill.; Taunton, Mass.; Jacksonville, Fla.; Galveston, Tex.; Joplin, Mo.; Bay City, Mich.; Ft. Worth, Tex.; Easton, Pa. The following own gas works: Philadelphia, Pa.; Toledo, O.; Richmond, Va.; Duluth, Minn.; Wheeling, W. Va.

The special report of the United States Census on "Central Electric Light and Power Stations" states that there are 732 cities and towns served by municipal stations only. Powers' "Central Station Directory" ($4 a year) will give the names of the cities having municipal electric light plants and some statistics concerning them. Brown's "Directory of American Gas Companies ($5) will do the same for municipal gas plants.

FORM OF RAIL FOR PAVED STREETS —CLEANING ASPHALT STREETS.

I wish to know if you can inform me fully regarding the kind of rail the surface railroads for street cars are using where the streets are paved and made permanent. I refer to the larger cities of the East and middle West. Do they, as a rule, use a flanged or a "T" rail?

What do you know about the advisability of cleaning asphalt pavements by flushing with water, or should they be cleaned as nearly dry as possible? What do you know about the "sanitary street-flushing tank," as manufactured in St. Louis, Mo.?

W. R. ROY, Supt. of Streets,
Spokane, Wash.

Most cities of the East and middle West use the flanged rail with flat tread. A few use a grooved rail and, especially since the advent of interurban cars, which need deeper flanges for rails, a few have adopted a T rail. As used on one of the principal interurban entrances to Indianapolis the T rail seems to be very satisfactory. The rail is the seven-inch Shanghai T rail, on ties ballasted with concrete, with a special shaped nose brick adjoining the rail in the pavement to form a groove for the wheel anges. For ordinary street cars the flat, flanged girder rail, seven to nine inches deep, with ties not more than two feet apart and concrete foundation under them and the pavement between the rails, seems to meet all conditions as satisfactorily as possible. The grooved rail may be more satisfactory for the vehicle traffic, but in most cities the comparatively slight difference between the two rails on this account is more than overcome by the troubles which the railroad company and the street cleaners have with the grooved rail. Thoroughly good foundations, stiff rails and a good pavement for the surface are the most important factors. The fitting of the pavement to the rail, if the railroad company is required to do the work or at least pay for it, can be done so as to make a satisfactory surface with any reasonable form of rail head.

Asphalt pavements may be flushed with water, and this method of giving streets in the business district a thorough cleaning once each day or so is having some popularity. The force with which the water is applied has an important bearing on the life of the pavement. Any slight imperfections are searched out by a powerful stream and the defective parts are

carried away. Occasionally this shortens the life of an asphalt street, but it is sedom that such disintegrating spots are welded into the pavement again under traffic. The flushing tank referred to has a supply of air under pressure, which forces the water out of the tank with velocity and volume enough to carry off all the street dirt, even out of the joints in rough rock pavements. Theoretically the principal damage which water does to asphalt pavements is by standing on the pavement and dissolving out soluble materials in the surface of the paving, thus making the pavement porous and reducing its tenacity. The use of water on level streets which have uneven surfaces would injure asphalt pavements on this account. Streets which have good grades or heavy crowns and good gutter grades to the catch basins would not give rise to this objection to the flushing of asphalt streets.

DATES OF CONVENTIONS.

Kindly advise us where we can obtain information concerning the location and dates of cement users', contractors' and lumber men's conventions.

J. E. WHITE,
South Bend, Ind.

The conventions of cement users, contractors and lumber men for this year are about over. The only ones set for early meetings are the National Lumber Manufacturers' Association, May 8 and 9, at St. Louis, Mo., and the National Hardwood Lumber Association, May 3 and 4, at Memphis, Tenn.

The National Association of Cement Users will hold its next convention in January, 1907, and the cement users or the Northwest and of Iowa will hold theirs in January and February, 1907. The Nebraska Cement Users' Association held two meetings recently, as stated in the department of "Organizations and Individuals" in this number of MUNICIPAL ENGINEERING, and will hold others as may be necessary.

There are many lumber associations in all branches of the trade—lumbermen, lumber manufacturers, wholesale lumber dealers, retail lumber dealers, dealers and manufacturers of special kinds of lumber, etc.—and there does not seem to be any published list showing their names, officers and convention dates. Some of the associations meet annually and some oftener, even monthly in some cases. The numerous trade papers in the lumber field make more or less definite reference to the conventions from time to time, and it will be necessary to watch them for announcements of meetings.

The railroad passenger associations issue monthly or more frequent bulletins showing the locations of conventions for which arrangements for reduced rates have been made. These can be consulted at the offices of railroad ticket agents quite generally.

CANADIAN CEMENT MARKET.

In your April issue of MUNICIPAL ENGINEERING I read the article entitled "Canadian Cement Market." As the writer was the pioneer of the Portland cement industry, having been the first to manufacture and market Portland cement in Canada, and at the present time having large interests in four of the largest Portland cement factories in Canada, I would like to correct the error in the article referred to.

In 1900 the Owen Sound Portland Cement Company furnished the city of Hamilton with its cement. In 1901 they took large contracts in Winnipeg, which markets they have been supplying with cement continually since that time, and they were not in a position to furnish the required cement for Winnipeg and Hamilton and take care of their other local trade. The other Canadian cement works were not as well located for shipment to Hamilton, and, owing to the low prices prevailing in the American market, the Hamilton contract was awarded to one of the new American cement factories, which took the Hamilton contract in 1901 at a price which was extremely low, so much so that they lost money.

I have not the exact statistics as to the consumption of cement in Canada for the past five years, but I am confident that the American cement companies have furnished not to exceed 25 per cent. of the cement consumed in Canada in any year.

A conservative estimate of the output of the fifteen Portland cement factories in Canada this year will aggregate about 3,000,000 barrels. This does not include the four cement factories which are nearly completed and will have cement to market this fall.

The population of Canada is a trifle under 6,000,000. The highest per capita consumption up to 1903 was one barrel for every four persons. This was about the rate in Germany, England and the United States.

In 1906 the Canadian mills will produce cement equal to one barrel for each two persons in the Dominion of Canada. From this you will observe that there is sufficient cement produced in Canada to take care of the consumption.

With reference to the quality of Canadian cement, it is needless to say that there is no better cement produced in any country. All of the Canadian mills are equipped with the latest and most improved machinery, have skilled chemists and are under the supervision of capable management.

E. BRAVENDER,
Hudson, N. Y.

The article in the April number referred to gives abstracts from United States consular reports, which do not give the authority for their statements except the phrase, "according to statistics for 1904." The "Handbook for Cement Users" ($3),

1905 edition, states that the Canadian mills made 908,990 barrels of Portland cement in 1904 and imported 784,630 barrels, about half of which came from the United States, which would be but little more than 20 per cent. of the total amount of Portland cement used in Canada. Mr. Bravender's estimate for 1906 shows a more rapid increase in the use of cement in Canada since 1904 in proportion to population than has taken place in the United States.

CEMENT WORKERS' UNION—INDEPENDENT CEMENT DEALERS.

I noticed, either in your magazine or in some of the other periodicals, reference to the Cement Workers' Union. Can you put me in correspondence with it. It is a thing almost impossible for me to find a house where I can buy cement directly from wholesale dealers. Reference is almost always made to agents in Omaha, who in turn refer me to our local dealers, who charge from 75 cents to $1 per barrel extra, and they themselves are engaged in the cement-work business. It does not set very well. P., ——, Neb.

The secretary of the National Union of Cement Workers is Henry Ullner, 311 Clunie Building, San Francisco, Cal.

There is much complaint in many sections of the West with reference to the cement market condition referred to. The cement-block and concrete workers of Oklahoma and Indian Territory have organized an association with the purpose of securing better prices, and it is possible that this is the only way in which the desired results can be obtained. As usual, there are two sides to the question, and a full discussion of the subject should bring about a condition of the market which will do injustice to no one.

The Nebraska Cement Users have recently formed an association whose principal object is to bring about some improvement in this condition. In the department of "Organizations and Individuals" in this number of MUNICIPAL ENGINEERING will be found an account of their first meeting and the names of officers. Membership in such associations is suggested to several inquirers for methods of securing cement at reasonable rates.

NAMES OF MANUFACTURERS AND JOBBERS OF CEMENT.

Please give us the names of several manufacturers or jobbers of Portland cement. J. R. P., Elsberry, Mo.

From the "Directory of American Cement Industries" ($5) the following names of manufacturers of cement and sales agents in Missouri and States adjacent are taken:

Arkansas—Southwestern Portland Cement Co., White Cliffs.

Illinois—Chicago Portland Cement Co., 1016 Stock Exchange, Chicago; German-American Portland Cement Works, 1511 Marquette Bldg., Chicago; Illinois Steel Co., Rookery, Chicago; Marquette Cement Mfg. Co., Marquette Bldg., Chicago; Silexoid Portland Cement Co., 39th st. and Lowe ave., Chicago, all Portland cement manufacturers, and the following natural cement manufacturers: Illinois Hydraulic Cement Mfg. Co., Utica; Utica Cement Mfg. Co. and Utica Hydraulic Cement Co., Utica; and the following sales agents: E. L. Cox, 1511 Marquette Bldg., Chicago; Wm. Dickinson, 1513 Marquette Bldg., Chicago; E. H. Hennessy, 740 Marquette Bldg., Chicago, Ill.; Marblehead Lime Co., 1105 Masonic Temple, Chicago; Meacham & Wright Co., Chamber of Commerce Bldg., Chicago; C. E. Shauffler, 308 Western Union Bldg., Chicago; F. J. Morse, 519 Chamber of Commerce Bldg., Chicago; S. J. Vail, 172 E. Washington st., Chicago; C. H. Wood, 902 Chamber of Commerce Bldg., Chicago.

Kansas—Portland cement manufacturers: Iola Portland Cement Co., Iola; Kansas Portland Cement Co., Iola; Western States Portland Cement Co., Independence. Natural cement manufacturers: Ft. Scott Hydraulic Cement Co., Ft. Scott; Kansas City and Ft. Scott Cement Co., Ft. Scott. Sales agents: B. E. Allison, Iola.

Kentucky — Kosmos Portland Cement Co., Todd Bldg., Louisville, Portland; Louisville Cement Co., Silver Creek Cement Co., Union Cement and Lime Co., all in Louisville, makers of natural cement. H. M. Frankel, 151 Third st., Louisville; Western Cement Co., Louisville, sales agents.

Tennessee—Chickamauga Cement Co., Chattanooga.

CURING CEMENT BLOCK AND BRICK IN WATER.

Can you advise us if cement blocks or cement brick can be cured by immersing them in water, and how long they should be immersed to be cured so that they would not require any water after being taken from the tank in which they were immersed. GRIMSHAW & LACRAFT, Clark, S. D.

Cement blocks and bricks can be so cured, but the success met with by this method has not been great. The blocks must be left in a moist atmosphere for about twenty-four hours before putting them in the water, and the later setting seems to take more time than is required in the air when the blocks are well sprinkled. It is reported also that it is more

difficult to prevent hair cracking on the surface of blocks cured in the water.

The best results are obtained when enough water is added to the blocks by some such method as sprinkling and the atmosphere in the curing room is kept moist during the curing period. Some manufacturers use exhaust steam with success and report some shortening of the time required for curing on account of the process not being stopped by the drying out of the blocks.

Can any of our readers report the results of experiments on curing blocks or bricks in water?

HOW TO PUT ON SLAP-DASH FINISH.

The following appears in a set of specifications:

"Cover all vertical walls of exterior with approved metal lath, cover with thin coat Portland cement. After strap work is applied flush panels with thick coat of Portland cement, slap-dash finish."

Could you give me any information in regard to this work; also, what tools are used in applying this finish?

F. C. S., ——, Mass.

This is a special term for finish, the exact nature of which depends upon the local custom. No special tools are necessary, the usual rough finishing with trowel or float forming the base, and the finish, whether pebbles, glass, cement, etc., being applied by hand, mainly by dashing them into the soft surface. This description assumes that the work has been properly done and has set properly up to the time of applying the finish.

STRENGTH OF CONCRETE WITH HYDRATED LIME.

Can you advise me where I can get a copy of the United States government report on the use of hydrated lime in Portland cement. I have understood that the government engineers claim that 10 per cent. of lime will increase the strength of concrete.

A. F. NIMS,
Philadelphia, N. Y.

In Newberry's paper on "Concrete Building Blocks," in the April number of MUNICIPAL ENGINEERING, vol. xxx, p. 255, is a statement that certain proportions of lime, thoroughly hydrated, can be used in making blocks without reducing the strength of the concrete. In Sabin's "Cement and Concrete" ($5) are some results of tests of briquettes made with varying percentages of hydrated lime, showing increase in strength for proportions less than about 20 per cent. These results were probably taken from tests made by the author in his work on the St. Mary's canal, and the reports of the engineer officer in charge of that canal, Gen. O. M. Poe, and his chief assistant engineer, E. S. Wheeler, for 1894 and later, contain the original reports of the experiments.

BREAKING STRENGTH FORMULÆ FOR CONCRETE BEAMS.

In a paper by Henry Goldmark before the Canadian Society of Civil Engineers will be found a discussion of some formulæ fr the breaking strength of reinforced concrete beams, which may be added to the collection given in MUNICIPAL ENGINEERING, vol. xxix, p. 347. Following are the formulæ, some of them being slightly different methods of writing the formulæ of the same authors given in the article noted and others not having been given there, and all being reduced to the same notation used therein, with some additions:

y_1 is the distance from the top of the beam to the neutral axis,

y_2 from the steel to the neutral axis,

y_3 from the centroid of compression to the neutral axis.

M is the moment of resistance of the beam.

b is the breadth, h the depth of the beam, and d the depth to the center of the steel reinforcement.

x is the ratio of y_1 to $y_1 + y_2$.

p is the ratio of cross section of steel to cross section of concrete.

P is 100p.

S is the area of steel reinforcement.

f is the unit tensile stress of steel.

t is the unit tensile stress of concrete.

c is the unit compressive strength of concrete.

Ec is the modulus of elasticity of concrete in compression.

Es is the modulus of elasticity of steel.

Thacher's formula may then be written:

$$M = \frac{f}{36}\left(\frac{y_1^3\,Ec}{y_2\,Es} + 3\,Sy_2\right)$$

Sewall's formula is

$$M = 0.292\,cby_1^2 + fSy_2$$

Buel and Hill's formula is

$$M = 2fSy_2 = \tfrac{2}{3}cby_1^2$$

Von Emperger's formula is

$$M = fS\,(d - \tfrac{1}{3}y_1)$$

Wentworth's formula in inch-pounds is

$$M = 6cy_1\,(d - \tfrac{1}{2}y_1)$$

Hennebique's formula is

$$M = 350by_1^2$$

Johnson's formula is

$$M = fS\,(y_2 + \tfrac{2}{3}y_1) + \tfrac{2}{15}tby_2\,(\tfrac{1}{2}y_2 + \tfrac{2}{3}y_1)$$

Goldmark's formula is

$$M = \tfrac{1}{2}cbd^2\,(1 - \tfrac{1}{3}x) = fpbd^2\,(1 - \tfrac{1}{3}x)$$

Mr. Goldmark's article discusses the assumptions of the formulae and reduces them to the same general case for purposes of comparison, and includes several of the formulæ given on p. 347 of vol. xxix, which take a somewhat more complicated form on this account. His article is worthy of close study.

INCREASE IN USE OF GOOD PAVING MATERIALS.

I would like to know if the use of sheet asphalt as a pavement in the United States is on the increase or decrease. A table showing the total amount laid each year in the United States from 1890 would be of great service to me; also please state if the use of vitrified brick, block asphalt, and wood block as a pavement is on the increase. PAVEMENT,
Norfolk, Va.

There are no available statistics giving the amount of asphalt pavement laid each year since 1890. There has certainly been a great increase in the amount laid and the increase per year has quite steadily grown. The figures from the statistics of cities collected by the United States Census Bureau in 1890, 1902 and 1903 will give some idea of this increase. Thus in 1890, 47 cities were reported to have 394 miles of asphalt pavement. In 1902, 121 cities had 2,530.9 miles. The average increase per year for the 12 years is 6 new cities each year and 178 miles of new asphalt pavement each year. In 1903 there were 135 cities with 2,841.6 miles of asphalt pavement. The increase for the one year is 14 cents and 300.5 miles of asphalt. These statistics are not complete, for the returns for the census of 1890 are restricted to cities of more than 10,000 population, 345 in number, and those of 1902 and 1903 to cities of more than 25,000 population, 160 in 1902 and 175 in 1903.

All the cities reporting asphalt pavements in 1890 are in the report for 1903, except Stockton, Cal., Sedalia, Mo., Shenandoah, Pa., and Newport, R. I., but the appreciable number of cities of less than 25,000 population now having asphalt pavements is not included.

There is no separation of sheet and block asphalt. It is the general impression that the use of asphalt blocks has not increased in the same proportion as the use of sheet asphalt.

There is also a considerable increase in the use of brick and wooden block pavements. Selections from the census tables have been printed in MUNICIPAL ENGINEERING, from which some idea of the extent of the use of the various paving materials can be gained. In vol. xxix, p. 430, is a table showing the number of square yards of stone, brick, wood and asphalt pavements in use in each of the 175 cities of more than 25,000 population in 1903. In vol. xxx, p. 203, is a statement of the amount of asphalt pavement laid in 1902 (not 1903) by each city having asphalt pavement, and on page 204 a similar statement regarding brick paving. The zeros in this list, some of them, indicate decline in relative popularity of the material, but most of them are present on account of cessation of paving work for the year, rather than change to any other kind of paving. The following table shows the amount of wooden block paving laid in 1902 and the amount in use in 1903 for each city above 25,000 having this kind of pavement:

STATISTICS OF WOODEN BLOCK PAVEMENTS.

City.	Sq. yds. in use in 1903.	Sq. yds. laid in 1902.
New York, N. Y.	12,821	10,656
Chicago, Ill.	12,679,000	Reduction
St. Louis, Mo.	62,741	1,471
Boston, Mass.	23,653	Reduction
Baltimore, Md.	2,960	925
Cleveland, O.	2,733	0
San Francisco, Cal.	1,660	0
Milwaukee, Wis.	1,060,448	Reduction
Detroit, Mich.	4,041,778	104,581
Minneapolis, Minn.	734,776	Reduction
Indianapolis, Ind.	342,520	2,576
Kansas City, Mo.	1,951	Reduction
St. Paul, Minn.	131,020	Reduction
Rochester, N. Y.	17,377	0
Toledo, O.	186,672	Reduction
Memphis, Tenn.	0	Reduction
Omaha, Neb.	290,923	0
Lowell, Mass.	375	0
Portland, Ore.	52,060	5,480
Gr'd Rapids, Mich.	152,240	Reduction
Seattle, Wash.	4,610	760
Hartford, Conn.	1,594	1,594
Troy, N. Y.	540	0
Oakland, Cal.	22,176	0
Springfield, Mass.	5,652	2,872
Des Moines, Ia.	6,732	0
Utica, N. Y.	1,849	1,849
Kansas City, Kan.	73,920	0
San Antonio, Tex.	58,935	0
Duluth, Minn.	538,326	0
Elizabeth, N. J.	112,657	0
Harrisburg, Pa.	3,006	3,006
Ft. Wayne, Ind.	80,845	Reduction
Saginaw, Mich.	289,946	Reduction
Tacoma, Wash.	26,000	0
Dallas, Tex.	211,200	Reduction
Lincoln, Neb.	71,365	Reduction
Mobile, Ala.	80,000	0
South Bend, Ind.	6,931	Reduction
Springfield, O.	297	0
Topeka, Kan.	34,445	0
Terre Haute, Ind.	13,552	0
Dubuque, Ia.	880	0
Superior, Wis.	802,551	Reduction
Springfield, Ill.	30,413	Reduction
Rockford, Ill.	600	Reduction
Sioux City, Ia.	169,639	Reduction
Galveston, Tex.	44,116	Reduction
Racine, Wis.	106,726	0
Joliet, Ill.	5,635	0
Oshkosh, Wis.	195,000	0
Council Bluffs, Ia.	109,136	0
Kalamazoo, Mich.	4,300	—
Bay City, Mich.	461,803	Reduction
Aurora, Ill.	6,000	—

This table is of little value except to show the passing of the old round wooden block. Every city showing a reduction in area of wooden block in 1902 is afflicted with this class of pavement and is now actively engaged in replacing it with better paving materials. Other cities having the same class of pavement did not happen to replace any in 1902, and a few, like Detroit, are using the cheap block pavement

in place of gravel or macadam where there is little traffic, because it is cheaper. The extension of the use of the new and good wooden block pavement is not shown in the table because it is comparatively slow and is obscured by the changes in the earlier unsatisfactory form. Chicago replaced nearly a million yards of the round blocks with other pavements in 1903 and several cities approximated 100,000 yards each.

LIQUID WATERPROOFING FOR CONCRETE BLOCKS.

In your opinion, would an article put up in liquid form that would make concrete blocks waterproof be a good thing if it was easy to apply, did not discolor the block, was not affected by the heat of summer nor the cold of winter, would last as long as the stone lasts and was not expensive, say to cost $3 for a gallon, which would cover 300 square feet of surface? F. L. W., ——, Ind.

An article which has all the qualities mentioned and will not shorten the life of the blocks should have a large sale. There have been many waterproofing compounds on the market, but most of them have disappeared because they failed in one or more of the essentials named.

USE OF LIME IN CONCRETE BLOCKS.

At the Milwaukee convention of Cement Users a paper was read by J. L. Mothershead on "Waterproofing," which is reprinted in your issue of February, 1906, containing the following statement:

"I would also like to touch on the use of lime in mixing the blocks. The practice is becoming quite general and, I believe, largely through ignorance on the part of manufacturers. You all know that lime in the usual form is detrimental to the strength of the block, but a great many believe that the hydrated form is safe to use. This is a mistake and should be carefully guarded against. I read an article in one of the magazines devoted to cement recommending the use of hydrated lime for waterproofing, and was surprised to find such ignorance on the part of the editor. The hydrated lime, when used in the blocks, is attacked by the carbonic acid in the air and changed to carbonate of lime, which has a tendency to disintegrate the blocks and deposit a white stain on the outside."

As I have strongly recommended the use of hydrated lime as an ingredient of concrete blocks, in papers which I have written on the subject, I have received many letters from cement users asking my opinion of Mr. Mothershead's statements, and take this opportunity to say that his objections to the use of hydrated lime are wholly unfounded and appear to be based on complete ignorance of the subject or on his wish to promote a waterproofing material of his own invention. Well-slaked lime has been used as an ingredient of cement mortar ever since the introduction of Portland cement, especially in France and Germany, with perfect satisfaction, and foreign authorities speak most highly of the results obtained. It is possible to replace one-third or one-fourth of the cement used by slaked lime without loss of strength, and the addition of slaked lime to concrete which is to be exposed to the air improves its waterproof qualities and its strength. There is absolutely no ground for the statement that well-slaked lime causes concrete to disintegrate or to develop efflorescence. The conversion of the lime into carbonate goes on gradually on exposure to the air, as is the case with ordinary lime mortar or with Portland cement, and the hardening of lime mortar in the air is largely due to this cause.

I take this opportunity to protest against Mr. Mothershead's statements, believing that they are calculated to give a false impression, and may be an obstacle to progress in the direction of the rational use of concrete.

S. B. NEWBERRY,
Sandusky, O.

The above letter was referred to Mr. J. L. Mothershead, who has prepared the following reply:

In answering Mr. Newberry regarding the use of hydrate of lime in cement work, I see nothing better to say than that, as is known, Portland cement is a combination of silicate of lime with aluminate of lime, part of the alumina possibly being replaced by iron oxide. The lime is all combined in good Portland cement.

Sometimes an excess of limestone gets into the cement from some cause or other, and there is then free lime in the Portland cement, and most specifications require that the Portland cement be cured or aged so as to change this excess of free lime into carbonate or possibly slaked lime, as it is then less objectionable than in the state of free lime. The cement so aged might be good cement, though having an excess of uncombined lime, but it would not be so on account of the excess of lime, but in spite thereof.

As all the silica in cement is in combination there is nothing to combine with any lime subsequently added to the cement, except the sand or grouting material added when the cement is used in building, and this—that is, the mixture of sand or silicious matter with lime—is, of course, common mortar. Reduced to its elements, therefore, we have, in the case of excess lime being added to finished Portland cement, the same thing as the mixing of common lime mortar with Portland cement. A careful analysis of the subject will show this to any one. Now, with this view of the matter, who will hold that the Portland cement is improved by the lime? The mixture will be an improvement over common lime mortar, of course.

As lime and cement are mixed to strengthen lime mortars, we have a case which will be granted—that Portland cement strengthens lime mortar, but lime does not strengthen Portland cement mortar. Slaked lime or hydrate of lime, when added to Portland cement, is made from burnt limestone. When the lime is slaked or hydrated it swells up to a paste, containing much water. When this is mixed with concrete the paste lime occupies a certain space; this paste, being composed of probably 90 per cent. water, finally dries out and leaves a void,

thus increasing the porosity of the concrete. The question of lime water leaving a white stain on stone need not to be discussed, as it is too obvious.

As to the use of slaked lime abroad or anywhere else by cement users, it will be found that slaked lime is only used properly with cements having a deficiency of that element in their original composition. Mr. Newberry says: "It is possible to replace one-third or one-fourth of the cement used with slaked lime without loss of strength, and the addition of slaked lime to concrete which is to be exposed to the air improves its waterproof qualities and its strength."

This can only mean that by taking one pound of lime and three pounds of cement he will have four pounds of a mixture equal in strength to four pounds of the original cement, or, if it is to be used in "concrete which is to be exposed to the air," is strength will be improved. This amounts to one of two conditions—either lime is stronger than or as strong as cement or Mr. Newberry has invented a new system of addition.

The former, coming as it does from a cement manufacturer, will be of general interest and also help the sale of lime, while the latter will be a matter of universal consideration. Also, as he inferentially grants that more than one-third lime may be detrimental, he is somewhat involved. His case figures out as follows in a real example:

100 per cent. Portland cement briquette breaks at 100 pounds.

75 per cent. Portland cement, 25 per cent. lime, breaks at 100 pounds or over.

66 2-3 per cent. Portland cement, 33 1-3 per cent. lime, breaks at 100 pounds or over.

This shows conclusively that slaked lime as a building material has not really been appreciated until now.

J. L. MOTHERSHEAD, JR.,
Manager Astral Drier Co.

A word or two regarding "free lime" in cement and "hydrated lime" in concrete may serve to clear up the confusion which seems to exist in Mr. Mothershead's mind as well as in the minds of some others.

When cement is burned in the rotary kiln and then ground, the "free lime" exists in it in its active form, and when water is added in making mortar any lime which is in excess of that necessary to make the chemical combinations of the silica, alumina, iron, etc., absorbs water in the same way that quicklime absorbs water, swells and produces the phenomena which cause the cement tester to pronounce the cement unsound. When perfectly hydrated lime is added to mortar or concrete it has already absorbed its full amount of water, it does not swell and there is no disintegration of the mortar or concrete.

It is a demonstrated fact that the addition of very fine material to mortar increases its strength, provided this fine material is necessary to fill the voids in the aggregate. Whether this fine material is sand, lime, clay or even loam seems to make little difference. The experiments seem to indicate:

1. That the strength of concrete with a given aggregate increases as the amount of cement increases until there is sufficient cement added to fill the voids. Any additional cement is of no advantage and may, under some circumstances, even cause the strength of the concrete to diminish.

2. That with a given proportion of cement the strength of the aggregate is increased by filling the voids therein by whatever means is convenient, but that if, for example, the voids are filled by the addition of fine material, such as clay or hydrated lime, this increase in strength stops when the voids are filled, and any additional amount of fine material reduces the strength of the concrete. The limit of proportion of fine material to cement is stated by Mr. Newberry to be one-third. The actual amount varies somewhat according to circumstances.

Practical concrete workers fear the use of clay or loam or the use of sand or gravel containing clay or loam, because of the lack of uniformity in quality and proportion found in the natural mixtures and because of the discoloring of exposed surfaces.

Very fine sand and hydrated lime give the best results because their quality can be controlled and the quantity added can be definitely determined. They are not more generally used mainly because the cost of the materials and of adding them to the mixture is too great for the cheaper classes of work in which they are desired. When block makers and builders of reinforced concrete buildings try to see how well they can build, rather than how cheaply, the use of these good fine materials will increase.

As stated above, there is no danger of disintegration of concrete from swelling of perfectly hydrated lime thus used as a filler, and there is no more danger of increase in porosity from evaporation of the water in the lime part of the mortar than in the cement. All the water in ordinary concrete used where lime is advantageous will be needed for the chemical changes, and they produce the dense structure which prevents the washing out of soluble matter from the concrete. The change of lime to carbonate on exposed surfaces probably aids in maintaining the impervious surface. The question yet unsettled is as to efflorescence. Is it increased or diminished by the use of the hydrated lime?

MANUFACTURERS OF HYDRATED LIME.

If you can give us the names of manufacturers of hydrated lime we will appreciate it very much.

M. & K., Lousiville, Ky.

The following makers of hydrated lime are at hand:

Charles Warner Co., Wilmington, Del.

Houston Brothers Co., Pittsburg, Pa.

Wm. Wirt Clarke & Son, Baltimore, Md., sales agents for the Standard Lime Co.

Buckeye Lime Co., Geneva, O.

Western Lime Co., Huntington, Ind.

Ohio Lime Co., Toledo, O.

Chickamauga Cement Co., Chattanooga, Tenn.

There are doubtless others, and the manufacturers of hydrating machinery, such as the Clyde Iron Works, Duluth, Minn., can doubtless refer to some of them.

CEMENT BLOCKS FOR CITY HALL.

Will you kindly give me some information in regard to cement blocks and the machines by which they are made? Would like to know something of the price as compared to brick. The town of Morganton, N. C., is thinking of building a small city hall and we thought something in the way of a cement front would be appropriate. W. B. S., Morganton, N. C.

The best source of information regarding concrete building blocks is MUNICIPAL ENGINEERING. A subscription begun at any time during the past three years will be most fruitful. The paper by S. B. Newberry before the National Association of Cement Users on "Hollow Concrete Blocks," part of which was given in the March number of MUNICIPAL ENGINEERING, is an excellent discussion of its subject. The entire paper can be obtained on application to the Association of American Portland Cement Manufacturers, Land Title Building, Philadelphia, Pa.

A good architect should be able to design a city hall so that it will be creditable, and a contractor who knows how to handle cement should be able to make good blocks which will make a creditable appearance. The articles by Louis H. Gibson, a series of which began in the December (1905) number of MUNICIPAL ENGINEERING, will give some excellent advice upon these points.

As to cost, the attempt in the past has been to make cheap blocks rather than good blocks, and consequently many blocks of poor quality, as well as many more blocks of good quality but poor appearance, have been turned out, to the injury of the trade. The comparative cost of cement blocks and of brick will depend on the cost of good brick, the cost of cement and of good materials for making blocks, and the relative cost of laying bricks and blocks in the wall. These vary according to local conditions. It is probable, however, that in almost any location good blocks will cost more in the wall than common brick and not more than good pressed brick, almost certainly not more than first-class face brick. Figures on this subject which have been published have usually not been very reliable because the blocks have not been good. Some houses have been put up with blocks cheaper than they could be with timber, but these blocks could not be recommended for a city hall.

PRODUCTION OF CEMENT IN THE UNITED STATES.

We have in our catalogue the production in barrels of cement in the United States from the year 1890 to 1903, inclusive. Have you any figures in your possession by which we could find out the production for the years 1904 and 1905?

N. B. MARPLE, Sec.,
Columbus, O.

In MUNICIPAL ENGINEERING, vol. xxx, p. 23, will be found an estimate of the manufacture of cement in the United States for 1905, stating that the production was probably slightly over 31,000,000 barrels. In the "Handbook of Cement Users" ($3) is a table showing the development of the cement industry, in which it is stated that the production in 1904 was 26,505,881 barrels.

The preliminary statement by the U. S. Geological Survey, printed elsewhere in this number, shows the production of Portland cement during 1905 to have been 36,038,812 barrels, showing a material increase over the average for the past three or four years.

MUNICIPAL MATTERS IN COURT

Water Company to Pay Interest—Oklahoma Sewer—Toledo Filtration—Railroad Taxes—Cleveland Street Railways—Bitulithic Decisions—Philadelphia Filtration Contracts—Washington Drainage Law—Chicago Tunnel Taxes—Alton Water Works.

Water Company Must Pay Interest.

A decision was handed down April 10 by Judge J. F. Philips of the United States district court in a suit of bondholders against the Sedalia Waterworks Company, of Sedalia, Mo., in which they sued for the payment of $6,000, claiming that it was due them as interest on bonds amounting to $200,000. The bonds are 20-year six months bonds, and the interest claimed is for the six months ending February 28. The court decided that the water company must pay the interest.

Oklahoma City's Sewer Contract Enjoined—Brick vs. Concrete.

A permanent injunction preventing the consummation of a contract between John Severns and C. A. Derr, of Guthrie, and the city of Oklahoma City for the construction of a sewerage system, was granted by Judge Burwell in a decision rendered April 12. The applicants for the injunction stated that the City Council had passed an ordinance authorizing the construction of the sewerage system. City Attorney Paul claims, on the other hand, that the City Council passed an ordinance ratifying the election for the bonds to construct the sewerage system, "according to the plans and specifications as prepared for the same," and that the action in awarding the contract to Severns and Derr was regular; that the city can hold them to their contract in the event they would decline to carry it out. The principal contention, however, lies in the question of concrete or brick for construction purposes, the citizens desiring the injunction asking that brick be used, while others want concrete used. It is claimed that concrete will be an experiment; that its availability for the purpose proposed is in doubt, and that $225,000 is too much money to expend for an experiment, while brick is known to be suitable for construction work. The outcome of the controversy is awaited with interest.

Construction of Toledo's Filtration Plant Again Delayed.

City Solicitor Northrup, of Toledo, O., announced on April 4 that it will be impossible for the supreme court to hear the case involving the construction of a water filtration plant until December, 1906, at the earliest. Simultaneous with this announcement comes the assertion from Bentley & Sons, subcontractors for the plant, that they will do nothing until the supreme court finally settles the case. Nothing can be done in the way of construction, therefore, until the spring of 1907, and the $565,000 now in the city's treasury for the establishment of pure water must lie idle for another year.

New York Central Railroad Must Pay Taxes on Entire Capital.

Argument was heard in the United States supreme court, April 9, on the validity of the franchise taxes imposed by the State of New York on the capital stock of the railroads invested in cars and other equipment and used wholly or partly in traffic outside of the State. Attorney General Mayer argued on behalf of the State of New York, and Thomas Emory appeared for the New York Central Railroad. The New York Central has brought five of these suits to recover the taxes it has paid on capital stock for the years 1900 to 1904, inclusive, amounting to about $302,600. The court of appeals of New York upheld the validity of the taxes and affirmed the dismissal of the bill of recovery. Attorney General Mayer argued that no federal question is presented in the case under review, and asked that the

action of the courts of the State of New York be affirmed and the writs of error dismissed.

Cleveland Electric Railway Charter Gives Control of Streets.

The United States supreme court, at Washington, D. C., rendered a decision in favor of the Cleveland Electric Railway Company, April 9, in the case of the city of Cleveland, Ohio, against the Cleveland Electric Railway Company. The case involved the right of the city to grant a charter to a new street-car line to operate in Woodlawn avenue, in the face of the contention of the company that its charter had not expired. A phase of the effort to force the 3-cent fares on the street railways in Cleveland was involved in the case. The electric company claimed the control of the streets of the city until 1908, and the action was begun by the company to contest the grant of a charter by the city to the Forest City Company for a line along Woodlawn avenue. The old company attacked this charter as a violation of its contract with the city under its own charter, and charging the granting of it to be "a part of a conspiracy between the city and the Forest City Company to compel the old company to submit to the 3-cent fares." The old company asked the courts to declare the new company's charter to be null and void, and to restrain it from proceeding. The circuit court granted this prayer, and the city appealed to the supreme court, with the result of securing an affirmation of this decision. Justice McKenna rendered the decision.

Some Recent Decisions Regarding use of Patented Pavements.

In April, 1905, property owners of Iowa City, Iowa, petitioned for pavement on part of Iowa avenue, recommending the use of bitulithic. In accordance therewith the city engineer made estimates in detail and the city council passed resolutions declaring necessity of paving and giving notice thereof. At proper times the council overruled objections of abutting property owners, approved plans and specifications, advertised for bids and received them and adopted the bid of the Barber Asphalt Company, the lowest offered, $1.96 a square yard, and entered into contract.

Abutting property owner, John A. Saunders, brought suit to restrain the city and the company from performing the contract and, following this, the council declared the contract forfeited because the company had not begun the work according to the contract. Bids were again advertised for and received in July, 1905, and Wm. Horrabin, the lowest bidder, at $1.98 a square yard, was awarded the contract and commencement of work was postponed until April 1, 1906, pending the settlement of the Saunders suit. Mr. Saunders instituted a similar suit against the city and Wm. Horrabin. The first suit was dismissed and on the last a temporary injunction was issued and the decision of the question whether the injunction should be made permanent follows:

1. The term "Warren Brothers' bitulithic pavement" is sufficient designation of the material to be used and the resolution of necessity need not include specifications as to time and manner of doing work.

2. The notice to property owners was sufficient.

3. The detailed estimate of the city engineer filled all demands for plans and specifications so far as the notice to property owners was concerned. "No reason exists why the specifications, designed to inform the property owners of the character of the improvement, should be as accurate or detailed as the specifications submitted to the bidder; if he is given sufficient information in order to form an intelligent judgment as to the character and cost of the improvement for which he is to be assessed, it is all that is necessary."

4. The seven-year guaranty clause in the contract is plainly a guaranty of materials and workmanship and not a provision for repair from wear or cuts for which the contractor is not responsible and does not, therefore, add a burden of repair which does not legally belong to the property owner.

5. We come now to the fifth objection urged, and which is probably the most important question in the case, namely, whether the requirement that a patented material be used, which covers a large part of the cost of the improvement, renders the contract void. It is obviously impracticable to consider at length the many cases of the various jurisdictions bearing upon or covering the question. We can only indicate in a brief manner what the more important of these holdings have been. The decisions are not without conflict, which is to some extent accounted for by the different statutory provisions regarding the letting of contracts. That a patented material may be used although controlled by one party and although it is required that the contract be let to the lowest responsible bidder, has been fully or to a certain extent held

in the following states: New York, Missouri, Colorado, Michigan, Pennsylvania, California and Tennessee. On the other hand, Wisconsin has held to the contrary and we will hereafter more fully discuss the Wisconsin view. It is also contended that certain cases in New York, California and Kentucky held against the use of patented material.

The two pioneer cases upon this question are: Dean v. Charlton, 23 Wis. 590, decided in 1868, and Hobart v. the city of Detroit, 17 Mich. 245, decided in 1869. In the Michigan case the right to specify a patent article in an ordinance for a public improvement is squarely upheld in a lengthy opinion written by Mr. Justice Cooley. This was a paving case requiring the laying of a Nicholson pavement. The Wisconsin case related to the building of a crematory and the contract was held void because it was a patented one and as a result there could be no competition in the bidding. The Wisconsin case seems to be fully sustained in the case of Holmes v. the Common Council of Detroit, 120 Mich. 266, decided in 1899. As to the Wisconsin case counsel call attention to the fact that the statute only required that the board of public works *may* contract with the lowest responsible bidder, while our statute requires that the contract *must* be let to the lowest responsible bidder. But the provision of our statute that authorizes the rejection of all bids makes the statutes the same in practical effect, because it authorizes the rejection of all bids and does not require the letting to the lowest responsible bidder if this bid is not satisfactory. So that if the bids are extortionate they can all be rejected. And it may be here said generally that we think the foregoing reason is a sufficient answer to the objection pointed out by counsel for plaintiff to a number of cited cases that the statutes in such cases did not require the contract to be let to the lowest bidder. Neither does our statute, because all bids may be rejected, and this provision gives the same protection against bids that are too high as does the permission that the contract may be let to the lowest responsible bidder.

In re Dugre, 50 N. Y. 513, it was held that patented pavement might be specified if it was the best that could be had.

The supreme court of Missouri in the recent case of Swift v. the city of St. Louis, passed upon the identical question under consideration. It related to the laying of Warren Brothers' patented bitulithic pavement, which was required under the specifications of the ordinance. The court says: "The main contention of plaintiff is that, specifying Warren's brand, they prevented competition and thus violated the charter. This question is by no means a new one. While the learned counsel for plaintiff urges that coal tar is a common article of merchandise and that the specifications should not have been limited to the Warren brand of coal tar cement, we think that the proof demonstrated that up to this time there was only one such cement so made as to be equal and uniform. . . . Having held as this court has in the Hunt case, 110 Mo. 32, and in the Vardam case, 131 Mo. 26, that the city is not precluded from using the best material merely because it is a patented article or a monopoly which denies competition, how can it be consistently ruled that it cannot use another equally desirable article because the evidence shows only one firm manufactured it? . . . But it is insisted that the board and municipal assembly might have accomplished the same result by selecting a cement of the standard of the Warren company. . . . We readily concede that if it had appeared that more than one firm made coal tar cement of uniform quality then it would have been the bounden duty of the board to have fixed a standard and invite competition; had the evidence disclosed that the other manufacturers made a coal tar cement suitable for binding the rock in the macadam, we think it would have been the duty of the board to select a standard of such cement and require bidders to conform to that standard and provide proper tests, but where, as in this case the whole supply is owned by one company or individual, and it is the only suitable article for public improvement, we see no reason for denying the city the right to avail itself of it, if we are to adhere to our former decisions permitting cities to use patented articles and materials in which one party has a monopoly by the ownership of the natural supply.

Counsel for the plaintiff cite certain language used in the Pointer case, 35 Cal. 599, in which it is said that where the practical effect of bidding is to have only one bidder, it is the enactment of a farce. But in the Quackenbush case, 104 Cal. 684, the Pointer case is referred to and this language is used: "Appellant's contention would effectually exclude all methods of paving which were patented, even though such method, because of its superiority or even because of its cheapness, would be specially advantageous to the owners of the property liable for the expense of the paving, as well as the municipality charged with its maintenance."

In the very recent case of Pricille v. city of Evanston, the question arose as

to the right to provide for the use of Warren Brothers' paving materials; there was involved the exact question we are considering; the case was tried before Judge Carter in the Cook county court. In a very full and exhaustive opinion he holds the right to specify patented materials. But it is not practical to set out in this discussion the many decisions of various courts as to the legality of specifying a patented material in an ordinance for public improvement; even to state the substance of the holdings of courts of last resort of the different states would extend this opinion to an unwarranted length. The only state in which such action is held to be illegal under all the circumstances is Wisconsin. We have referred to Dean v. Charlton as one of the pioneer cases upon the subject; this was followed by Kilvington v. the city of Superior, 33 Wis. 223, decided in 1892. Counsel disagree as to the terms of this decision, counsel for the defendant claiming that it practically overrules the Charlton case. It says: "In view of the legislation that followed Dean v. Charlton (a legalizing act) and the general tenor of the subsequent decisions and the further fact that patented methods and processes now enter so largely into the various classes and kinds of public works, we are not disposed to extend the case beyond the particular point there decided."

The court then states that the city had the patented material offered at a specified price and had the benefit of the competition that all the nature of the work admitted and that the statute ought not to be so construed as to prevent the city from using desirable patented works as to which there can in the nature of things be no competition. The court then adds: "While the rules of the Charlton case may be upheld as applied to assessments charged against abutting lots where the lot owners have the right secured to them to construct in front of their property an improvement for or in which a patented method or process is used, we cannot see that there is any good reason to hold that the statute applies to the patented material or process when in respect to all else the statutory requirements of competition is secured."

We are cited to a very recent case, Allen v. the city of Milwaukee, which has not yet been published. In this case the defendant city undertook to enter into a contract through its board of public works with the licensees of the Warren Brothers patented material for the use of the material a stipulated sum or royalty; the supreme court held that such contract was void. We will say in conclusion upon the subject of the authorities that, in our judgment, the clear current of authority in the various states that have passed upon this question holds that a patented material may be specified in an ordinance for an improvement provided there is no other material of the same kind of equal quality.

The decision rendered is that a permanent injunction should be refused.

The Supreme Court of Wisconsin recently handed down a decision reversing the decision of the lower court, which had previously decided in favor of certain contracts awarded in 1905 to the Central Bitulithic Paving Company in the city of Milwaukee, the lower court having dissolved an injunction which was reinstated by the Supreme Court, and the contracts having been held to be void upon two grounds:

First—Because the Central Bitulithic Paving Company had not filed its articles of incorporation with the Secretary of State of Wisconsin until two days after the contract was in fact executed.

Second—Because the city authorities did not follow the directions in chapter 5, section 23, of the city charter of Milwaukee with respect to patented pavements. The section referred to reads as follows:

Section 23. The said board [of public works] shall have power under the authority of the common council to make a contract or contracts with the patentee, or his licensees or assigns, to use any patent or patented article, process, combination or work for the said city at a stipulated sum or royalty for the use thereof, and thereupon the said board shall have power to order any work, whether chargeable to the said city or to lots or parts of lots, or parcels of land therein, to be done with the use of such patent, patented article, process, combination or work. . . ."

In making the contract with Warren Brothers Company for the use of the patents covering the construction of the bitulithic pavement, the board of public works of Milwaukee included in the contract the furnishing of the material used in the bitulithic surface mixture, expert advice, and laboratory service at the usual price of $1.40 per square yard. The court held that in making this contract the board had exceeded the authority granted by the charter above referred to, and that it should have contracted merely for the use of the patents.

These were the only two points passed upon by the Supreme Court in the decision referred to.

Suit to Recover $5,000,000 in Philadelphia Filtration Case.

Civil proceedings were instituted by the city of Philadelphia April 6 against the contractors and former city officials interested in the construction of the municipal filtration plant to recover $5,000,000 alleged to have been wrongfully retained by the defendants. Those named in the bill of equity filed with the prothonotary of the Common Pleas Court are: Israel W. Durham, former Republican leader of the city, State Senator Jas. P. McNichol, Anastasia McNichol, his wife, Daniel J. McNichol, John M. Mack, all of whom were at one time members of the contracting firm of Daniel J. McNichol & Co.; Wm. C. Haddock and Peter E. Costello, former directors of public works, and John W. Hill, former chief of the filtration bureau.

Washington State Drainage Law Sustained.

The Supreme Court of Washington handed down a decision April 4 sustaining the drainage law of 1895 as amended by the Legislature of 1905, which was attacked on constitutional grounds in the case of the State of Washington ex. rel. Charles Matson et al., plaintiffs, vs. the Superior Court of Skagit County. By the decision the law is left intact, except Section 5, providing for increase in bonds of commissioners, which is declared to be void. The case is reversed on the ground that the commissioners did not comply with the law as to presenting to the lower court a complete set of plans and specifications for the proposed work. The court had approved the plans and called a jury to assess damages to the lands included in the proposed drainage district. The option is now given of filing a new case or amending the plans heretofore submitted. The court says:

It is the duty of the commissioners to have a full and complete system prepared by a competent surveyor or engineer and draughtsman; that this system shall be complete, shall contain plans, specifications, details and estimates so that, if approved by the court, contracts may be made and the work performed in accordance therewith. It then devolves upon the court to pass upon the practicability of this improvement and determine whether the use to be made of the lands sought to be appropriated is a public use and to impanel a jury to assess the damages and benefits and fix the value of the lands so taken. Therefore it becomes the duty of the commissioners, if this action is not dismissed, to proceed with the improvement in accordance withe the plans submitted and approved by the court, without any substantial change. The petition in this case does not comply with the requirements of the statute, nor does the proof seem sufficient to support the findings. The trial court erred in its findings and in ordering that a jury be impaneled to assess damages and benefits and ascertain the value of the property.

Chicago Wire and Freight Tunnels must be Taxed as Tangible Property.

The Illinois Supreme Court handed down a decision April 18 holding that assessment of the bores of the Illinois Tunnel Company as tangible property must be made by the Chicago Board of Assessors. The decision handed down was in the mandamus suit brought by the city to compel a valuation by the local board on the tunnels constructed. The Illinois Tunnel Company, which has heretofore only been assessed for rolling stock and accompanying tangible property, must now be assessed on every inch of tunnel constructed. The Supreme Court holds, however, that the local board of assessors must value the tunnels as tangible property.

The decision, it is declared, will establish a precedent for all other public utility corporations by which the valuation of their franchise rights under, on and above the streets may be assessed by the local assessors.

Strenuous Action in an Alton Water-Works Suit.

Judge Humphrey, in the United States District Court, found Col. James Hamilton Lewis guilty of contempt of court April 16 because, as attorney for the Boston Water and Light Company, of Boston, Mass., he started a suit in the Madison county (Ill.) Circuit Court against the Alton Water Works Company and others to foreclose on second-mortgage bonds. Judge Humphrey had held that the water-works company was the property of the Farmers' Loan and Trust Company, as holder of the first-mortgage bonds, and had issued an injunction restraining any one from interfering with the operation of the plant or prosecuting any action in the bond matter. The suit filed by Colonel Lewis, it was claimed, jeopardized the sale of the water works to a syndicate.

Judge Humphrey sentenced Colonel Lewis to sixty days' imprisonment, but agreed to remit the sentence if Colonel Lewis would withdraw the suit, which he did.

PROBLEMS IN MUNICIPAL DEVELOPMENT

Ownership of Water Works—Studying Municipal Ownership—Gary, Ind.—Atlantic City Engineer—New Jersey Municipal Commission—Gas Charges—Reinforced Concrete at San Francisco—Cement Industry—Ohio Bridge Cases—Naming Specific Paving Material.

Private or Municipal Ownership of Water Works.*

BY C. W. WILES, DELAWARE, O.

Shall the city own its water works, or can it be operated more safely and economically by a private company? is a question often asked by the people, especially in the smaller cities.

The growing sentiment for cities to own and operate their semi-public utilities, such as water works, gas, electric light and street railways, has caused many to enter upon their administration without a thought as to the economy or advisability of such management.

It is well known that in many cities their operation is sought for, and largely controlled for the benefit of politicians, without regard to the cost to the public.

When a water works is operated by a company it is on the same basis as that of any other business, and is expected to return for its investment a reasonable per cent. on its cost.

When operated by the city it is supposed to yield a proper return to pay interest on bonds, provide for depreciation and repairs, and a fund for future extensions and payment of bonds, allowing the net profits to the citizens in the way of reduced rates for water.

In a large number of cities the payment for water used in public buildings, for fire protection, parks and sewer flushing to the water department is not recognized, and the consumer pays a sufficient rate for his water to meet all these added expenses.

If cities should pay into the water department a proper amount for fire protection, based on the number of hydrants, and for all water used in public buildings, parks, fountains and sewer flushing, then this department would be operated on the same basis as a plant owned by a company, less net profit. If the management could be as conservatively and economically carried on as by a company, then the people would receive water at first cost and save the net profit.

In a table prepared by Mr. Dow R. Gwinn, of Terre Haute, Ind., of 122 cities, 82 of which have municipal ownership and 40 private ownership, the following rates are shown:

The average for a six-room house with plants for domestic use in a house of six rooms is $5.98 per annum; by private ownership, $6.72, showing 74 cents on each in favor of municipal works.

The average for a sixroom house with closet, bath, washstand and thirty-foot lawn is: Municipal works, $16.75; private, $20.84; showing an average difference in favor of the municipal works of $4.09 per service per year.

This, with all other conditions being equal, would show the net profit to the private company.

This is not taking into account the fact that a larger proportion of these works who furnish filtered water are private ownership, and the cost to deliver good water is therefore greater than many of the larger works who pump direct from rivers or lakes.

Therefore the actual difference in the value of water is much less; also we must consider that private works must base their rates so that the revenue will meet interest on cost of construction, maintenance, repairs and a sinking fund for payment of bonds, while many municipal works, in the assessment of rates, make no provision for interest on cost, taxes or a reserve for payment of bonds, depending on a general tax for these items if the revenue from the consumer should be insufficient after paying maintenance and repairs.

There is no doubt that with the many advantages enjoyed by a municipal works, such as lower rate of interest on bonds, exemption from taxes and, in some cities, a frontage tax on unimproved property, with equally careful and economical management under experienced employes

*From a paper before the Central States Water Works Association.

they can supply water at a lower rate than a private company.

But with municipal works under a political management, where the employes are chosen because of their political influence and subject to change with every new city administration, where faithful and experienced men give way to ward politicians or favorites without regard to fitness, it is no wonder that public ownership of water and electric light, as well as any other public utility, may become an expensive burden to the taxpayer and the property rapidly depreciate in value.

In justice to municipal water departments, every city should cause to be paid into such departments a fair return for the water furnished for fire protection, based on the number of hydrants in service, for all water used in public schools and buildings, parks, fountains, sewer flushing, street sprinkling and all public uses. Then the water department would have credit for the service rendered and the management know how to apportion the rates to the private consumers, so as to secure an adequate return for the investment in the plant.

It is not just for the private consumer to pay an assessed rate sufficient to supply the city with water for the above-named purposes; they should be paid for in a general tax by the city, the same as though the works were owned by private parties.

In the discussion of the paper Mr. Wiles said:

I wish to bring out the fact that the man who manages a public water plant does not get credit for the work and services he renders to the city unless he is given credit for these several uses of water. Now, that $4.09 difference between public and private ownership would represent the actual profit, provided the water department was given credit for the amount of water it furnishes for sprinkling streets, fire protection and various other public utilities for which water is used in the city. My paper is designed to show that the managers of municipal plants, as a rule, do not get credit for the water that they furnish for these public services and for which they should have credit, just the same as the school board should have credit for the amount of money that it pays out for teachers, etc. They have no more right to ask the water department to furnish them water without the water department is given credit for it than they would have to ask the water department to supply them with school teachers free of charge. I was told of a case where a school department sent over to a water station that was under municipal ownership, and got several loads of coal and had it taken into the school building. Upon a protest being made by the water department, they said: "Why, the city pays for this coal." That was true, but the water department was charged with it and had a right to have credit. That is the point that I wish to bring out.

Mr. Clark said:

I think that in Ohio water works are compelled to furnish water for public purposes free. Under the decision of our city solicitor, who is a good lawyer, we furnish all the water that the city uses for fire and other purposes, and we find there is a good deal of waste. We have had to furnish a meter to determine where the waste was, at the expense of the water works entirely.

Mr. Cook said:

In Ohio we are all working under the same law. I have before stated that the city solicitors interpret the law in different ways, but if the law did not permit it I am quite sure that Columbus and Cleveland would not be charging for water used; for instance, the city of Columbus, for the street-flushing wagons, pays the Water Department $106 a month. The fire department pays for water used in their buildings, the school department pays for the water used in the schools. If the law did not permit it they could not do it.

Mr. Holmes asks if the interest paid on bonds is not covered by the hydrant rental. It would depend on the amount of the bonds and the number of hydrants you have. For instance, in my case our interest account is $32,000 per year. We have nearly 1,700 fire hydrants. A moment's calculation will show that hydrants will come pretty low in our town. In the case of some other city it might come out just about right.

Studying Municipal Ownership.

The American Commission on Public Ownership is busily employed conducting its inquiry in various British towns. Mr. Sullivan is in Glasgow, Mr. Crawford working in Liverpool, Mr. Winchester has joined Mr. James and Mr. Klumff at Manchester, and Mr. Maltbie has been at work in Birmingham.

These towns, with Sheffield and Leicester, have supplied thorough studies of the practical operation of tramways and gas and electric supplies by municipal or private corporations, and good tests for a comparison of the results of the preliminary survey have been made in Newcas-

tle, but the ground has not yet been broken in Bristol, and other cities may be substituted for each as a subject of inquiry. The commissioners have been well received everywhere and have exceptional facilities for the systematic examination of the results of municipal ownership. The new motor buses are recognized as a menace to municipal investments in tramways. Some town councils refuse to license them, but competition is generally allowed. Experts assert that their day may be short in consequence of the wear and tear of the mechanism by sudden stoppages in crowded streets and the necessity for constant reconstruction. The motor buses are seriously reducing the receipts of the London underground railways. The new Baker street tube lacks patronage and is retrenching expenses.

Gary, Ind.

Thus far Gary, Ind., is but a name, but it will soon become a thriving city of 60,000 to 100,000 population if the present plans are carried out. Work has already begun, and those in charge expect to have 400 houses ready for occupancy before the close of 1906.

The occasion for the new city is the location of the great new plant of the United States Steel Corporation on the shore of Lake Michigan. This organization has felt the cramping sensation of too little room at all its existing plants and has determined to have a site this time which will be ample for all its needs. There is a sort of island on the shore of Lake Michigan, surrounded on the other three sides by the Great Calumet river, which is approximately four miles long and one and one-half miles wide. Docks can be located on all sides of the site and the Great Calumet river can be made the greatest harbor on the lake. Probably 12,000 men will be employed in the great steel works, which are now under construction at this place and which will probably be pushed to completion as rapidly as possible.

To make a place in the sandy flats now covered with scrub oak and brush, in which these men, their families and those who will serve them can live, is the problem. Mr. A. F. Knotts, who gained much reputation as mayor of Hammond, Ind., when it was overrun with Chicago toughs, has been selected by the United States Steel Corporation to put the town in running order, and he is this month locating himself on its site and making the preliminary plans and surveys under which the work will proceed. Mr. Knotts has shows that he has many great ideas regarding the proper government of a city, and he will have almost a free hand in the establishment of the city of Gary.

The site of the city will be across the Great Calumet river to the south of the steel plant, on a level sand plain, a little more than twenty feet above the level of the lake. It extends about five miles along the harbor which will be formed in the river from the Little Calumet river eastwardly, and is about one and one-half miles wide.

It is hardly possible to give in detail the plants which will be followed, because they may be changed from time to time as circumstances require. Mr. Knotts has fully considered the sewerage and drainage of the site, the widths of streets, pavements, sidewalks and lawns, the kinds of pavement, the small park areas in blocks and in strips along the streets, the city buildings, civic centers in various districts containing the small business houses, the neighborhood club houses, which will be important municipal buildings, the libraries and branches, public halls and entertainment resorts, and all the factors which make a convenient and comfortable city in which to live. He considers the treatment of the saloon to be one of the most important subjects in a city of this kind and is working out a method for which he has great expectations.

A. F. KNOTTS, GARY, IND.

The question of the method of operation of public-service industries—street railway, water works, electric light plant and gas works—is one to which he has given much thought. In general his idea is that companies should be formed for the ownership and operation of these plants, but that their franchises should be such that their business success or failure and the reasons therefor can be determined by the proper authorities and the rates for service can be changed from time to time so that they will receive full compensation for the use of their capital, and at the same time the service shall be rendered at the lowest possible cost.

The steam railroads have already agreed to elevate their tracks through the city, and a strip will be reserved near them or along the water front for elevated interurban roads, so that this service will be rendered with as little danger as possible.

The Steel Corporation has already expended some $3,000,000 in purchasing the sites for the steel plants and for the city, and is expecting to spend several tens of millions upon the plant. The town lots will be sold under restrictions which will make effective the ideas of the founders of the town to those who will build upon them. Speculation in lots will not be permitted, the town being for the benefit of the employes of the company and not for the exploitation of land speculators. It will be necessary for the company to build many houses for employes, both because they must be ready before the men the men can be expected to build them and because they must beready before the men actually move their families on the ground, but they will be for sale to the employes occupying them at reasonable prices and on reasonable terms, for the fact is fully recognized that ownership of property is a great force in steadying a body of men and putting the individuals upon a solid and enduring foundation.

Such an opportunity has not before been offered for the development of an ideal industrial community, and Mr. Knotts has ideas which should result in a high measure of success if the detail can be worked out on the same high principles which animate them.

Atlantic City Engineer Should Have Salary.

The creation of a new department, that of city engineer or a department of city works, is proposed at Atlantic City, where an ordinance has been introduced to place the city engineer on a salary instead of a fee system.

A Municipal Commission for New Jersey.

In a joint resolution offered in the New Jersey Legislature, January 29, is formulated an effort to remedy the inconsistencies in municipal laws caused by a multiplicity of new statutes year after year. The bill provides:

Whereas, Municipal government is that form of government which most directly affects the people and therefore should be so economically and efficiently administered as to bear as lightly as possible upon them; and,

Whereas, Under the present provisions of the Constitution of this State a mass of municipal legislation is enacted at each session of the Legislature, which, though general in form, is special in application (thus evading the constitutional provision against special legislation), and thereby encumbering the statute books besides causing confusion and difficulty for municipalities not intended to be affected; and,

Whereas, Such legislation is frequently unconstitutional and a large part of the time and energy of the courts is spent in its construction and application; and,

Whereas, The principle of local self-government is recognized to be fundamental and essential to the welfare of the people; therefore,

Be it resolved by the Senate and General Assembly of New Jersey:

1. The Governor is hereby authorized and requested to appoint three persons as commissioners, who shall consider and report to the Governor, and to the Legislature on the first day of its next session, upon the whole system of municipal government in this State, relating to cities, towns, boroughs, villages, counties and townships.

2. Such report shall include the following:

A. The functions and powers of said municipalities in their relations to the State, to the citizen and to each other, respectively, and how far such functions and powers should extend.

B. How far and in what respects, if any, such municipalities, or any of them, may, with safety, be relieved from legislative control, in order to promote the principle of local self-government.

C. What, if any, general restrictions should be placed upon the powers and functions of such municipalities, or any of them, with respect to taxation, the issuance of bonds or other municipal obligations, and the creation of municipal indebtedness in general.

D. What, if any, constitutional changes are necessary or advisable with relation to municipalities in order to restrict or to safely enlarge their powers and functions.

3. They shall report such bill or bills as they may deem advisable for any or all of said purposes, having in view the curtailment of municipal legislation, the production of greater certainty in municipal law and efficiency in municipal government, and the decrease of taxation and of municipal burdens in general.

4. The necessary expenses of the commission, when approved by the Governor, shall be paid by the treasurer of this State, out of the treasury of the State, on the warrant of the comptroller.

Methods of Charging for Gas.*

BY A. E. FORSTALL, NEW YORK CITY.

As far as the writer's knowledge goes, this paper is the fourth one on the subject of "Methods of Charging for Gas" that has been read before the association. The first, read in 1891, and the second, read in 1898, dealt principally with the question of the equity of the common practice of charging for gas at a fixed price per 1,000 cubic feet, which was the same, either for all the consumers supplied by a company or for all of those in certain classes, without any regard to the differences in the cost of supplying different consumers arising from the different conditions under which the supply is taken in each case.

The author of the first of these papers, Mr. Walton Clark, submitted that it was inequitable to "collect upon the investment necessary to the service of one customer an interest greater or less than is paid by any other customer upon the investment made in his behalf," as was necessarily done when the charge for gas was simply a uniform price per 1,000 cubic feet, and that the equitable way of charging for the service furnished by the gas company was "to charge for each 1,000 cubic feet of gas an amount covering its proportion of the items of expense and interest common to the performance of the total service, adding to each bill so made the items peculiar to the individual service." The charge per 1,000 cubic feet should include the cost of supplying up to the inlet of the service pipe, including the amount per 1,000 cubic feet necessary for the payment of interest and dividends, and the individual items should be made up of the average cost of keeping the accounts, collecting the bills and attending to complaints, plus the interest and maintenance charges for the meter and service pipe employed for the particular consumer under consideration.

In the second paper the present writer, who was forcibly impressed, upon taking charge of the commercial after a service of twelve years on the engineering side of the gas business, with the number of consumers who, instead of bringing in a profit, were actually a source of loss when the expense of taking care of their accounts and the interest on the cost and the expense of maintaining their services and meters were taken into consideration, showed the effect that the system of charging advocated by Mr. Clark would have if applied to the gas company which he was then managing. For that particular case it was shown that the total cost per consumer of the maintenance of service, interest, depreciation and repairs on meters and labor, keeping the consumers' ledgers, making out and distributing bills, collecting the money for gas sales and attending to complaints, were, for an average length of service, but for different sizes of meters:

	Per Year.
3-light meter	$2.25
5-light meter	2.50
10-light meter	2.90
20-light meter	3.30
30-light meter	3.80
45-light meter	4.90
60-light meter	6.20

Therefore, before the company came out even on the business of any consumer using a five-light meter is was necessary that he should consume in a year an amount of gas that would bring in a profit equal to $2.50. If fixed charges on the amounts named above had been made and the price charged per 1,000 cubic feet of gas reduced to such an extent that the gross revenue from fixed charges and gas sold remained the same as the gross receipts for gas sales at the higher price per 1,000 cubic feet without fixed charges, the consumptions at which consumers would pay exactly the same amount in each case were:

3-light meter	19,000 cubic feet
5-light meter	21,000 cubic feet
10-light meter	24,000 cubic feet
20-light meter	28,000 cubic feet
30-light meter	32,000 cubic feet
45-light meter	41,000 cubic feet
60-light meter	52,000 cubic feet

Under the existing conditions the 63 per cent. of the consumers who used smaller amounts than these were not paying their proper share of the profit earned by the company, while the 37 per cent. using larger amounts were paying more than their share.

These papers received very little attention when they were read, the authors being told that they were probably right as to the equity of the proposed method of charging but that it was impracticable and never could be put into operation.

A third paper was read by Mr. F. W. Frueauff, at the 1904 meeting of the association. It approached the method of charging for gas along the lines that had been followed by Mr. H. L. Doherty, in working out the system of charging for electricity which is named after him. In this system a prominent place is given to the cost incurred by the electric company to enable it to take care of the maximum demand of the consumer, and a special charge is made to cover the cost under the name of a "maximum demand charge."

*A paper before the American Gas Light Association.

In applying the method to the gas business this feature is retained, and it is proposed to make a maximum demand charge in addition to the consumer's charge and to that per 1,000 cubic feet of gas sold. It is stated that an analysis made of the accounts of a gas company "brought out the startling fact that 19 per cent. of all consumers did not pay their output and consumer costs, that 34 per cent. did not pay their manufacturing, meter and demand costs, and that only 34 per cent. paid all the costs they occasioned, or that this 34 per cent. paid enough in excess of a reasonable amount to enable the company to make good its loss on the unprofitable consumers. This leads to but one conclusion, that they are doing business with a great number of consumers that are losing them money each month, and that they are selling them a very small quantity of gas, and from the other end of the table they found that from the comparatively few consumers who were using a large percentage of gas they were making a large profit after paying costs." It will be noted that the percentage of consumers carrying more than their share of the burden in this case does not differ materially from the corresponding percentage as given in the second paper. To remedy these conditions, it was proposed to put into effect "an optional system of charging whereby any of their consumers can buy gas by paying $12 per consumer per year, plus $15 per 100 feet of maximum demand, plus 60 cents per 1,000 cubic feet of gas."

It does not seem to be necessary to repeat the arguments advanced in these papers, and never refuted in the discussions upon them, in favor of the system of charging outlined. The system advocated in the last paper read is rather more elaborate than that advocated in the other two papers, but there is good reason for making charges of the character described in that paper. No information is given, however, as to the manner in which the amount of the maximum demand charge, which is not nearly as important in connection with the gas business as it is with the electric business, and that of the consumers' charge, which are named in the paper, are determined to be the proper and equitable ones for this particular case, and, since maximum demand and consumers' charges that are not based upon actual costs are just as inequitable, and, therefore, in the long run just as bad policy, as a simple uniform charge per 1,000 cubic feet, and as these charges seem to me to be entirely out of proportion to the cost of service, I propose to take up the question of the items that should be included in each charge and of the approximate value of these items. In doing this the classification of the standard system of accounts adopted by the association will be followed.

The items of cost that are imposed upon a gas company by the fact that the demand of each consumer for gas is not uniform but varies from hour to hour and from day to day, are those involved by the extra investment in plant required to supply the maximum demand over and above the investment that would provide all the plant called for by the average demand. No labor costs need be taken into consideration, although the intermittent working of a part of the apparatus, which is made necessary by the fluctuations in demand, does involve a slight extra cost for labor; this is so small in proportion to the other items as to be fairly negligible. The maximum demand charge is, therefore, made up of:

Interest and depreciation upon the cost of the portion of the manufacturing plant required to take care of the excess of the maximum make over the average make. The extra cost of maintenance involved by the use of this portion of the manufacturing plant. Interest and depreciation on the extra cost of the street mains actually required, on account of the size of the maximum demand, over the cost of the mains that would be required to take care of the average sendout. The extra cost of maintenance of street mains involved by their larger size, owing to the maximum demand. Interest and depreciation on the extra cost of service pipe actually required on account of maximum demand over the cost of the pipe that would be required for the average consumption. The extra cost of maintenance of the service pipe involved by its larger size. Interest and depreciation on the extra cost of the meter actually required on account of the maximum demand over the cost of that which would be sufficient to supply the average demand. The extra cost of maintenance of meters involved by this extra size.

Taking up these items in the order in which they are given, which is not only their order in the sequence of manufacturing and distributing operations, but is also, with the exception of the maintenance items, their order in importance, the first to be considered is the interest and depreciation on the cost of the excess plant made necessary by the maximum demand.

It would seem that to make an equitable charge on account of this item the conditions must be taken as they actually exist, and not as they would exist if the

gas company were supplying each of its consumers singly. Thus all that has to be provided for is the maximum demand resulting as an average of the maximum demand of all the consumers combined, and, therefore, this item has no relation to the maximum demand of any individual consumer and must be averaged among them all. To obtain its value accurately it is, of course, necessary to consider all the conditions of each individual case; but for the purpose of getting an approximate idea of what it should be, it can be worked out, assuming that the maximum day's make is one two-hundredth of the annual sales and that the average sales per consumer will be 25,000 cubic feet per year. If the average sales per consumer are larger than that, it is practically certain that the maximum day's make will be a smaller prprtion of the annual make and the increase in one direction is offset by the decrease in the other, so that the figures obtained in this basis will be fairly approximate.

The extra plant required by the excess of the maximum demand over the average demand will include the entire holder capacity and 165-365, or 45 per cent., of the total manufacturing plant. Assuming average conditions as to the holder capacity provided, and as to the cost of holders and manufacturing apparatus, the excess investment at the works, made necessary by the excess of the maximum demand over the average demand, will be $25 per consumer. Taking interest and depreciation on this investment at 10 per cent., the annual charge per consumer will be $2.50 per year. By a calculation, the details of which is not necessary to give, it is found that under the conditions named the extra cost of maintenance of the manufacturing apparatus and holders involved by the intermittent use of the former will amount to 30 cents per year per consumer.

As far as the street mains are concerned, few, if any, gas companies have a maximum rate of sendout per hour which is larger than 1-1600 of their total yearly sales, and as the average sendout per hour is 1-8760 of the yearly sales the maximum demand requires that the street mains have a carrying capacity of 8760-1600, or 5.5 times, that which would be required if the demand were perfectly uniform throughout the whole year. In the average street main system the average size of main works out a little under 6 inches in diameter, both as to size and as to cost of laying. If the sendout were absolutely uniform, it would only be necessary to have a street main system equal on the average to pipe of 3 inches in diameter, since a 6-inch pipe has a carrying capacity practically 5.5 times that of a 3-inch pipe.

The difference in cost between a 6-inch main and a 3-inch main would not vary very much from 25 cents per lineal foot in any locality. It is not out of the way to take an average of 100 consumers per mile, or one consumer for every 53 feet of main. The excess invesment in street mains per consumer caused by the maximum demand will, therefore, be 53 by 25 cents, which equals $13.25, and interest and depreciation on this at 10 per cent. will amount to $1.33 per year. This is also an average charge resulting from the combined demands of all the consumers and is, therefore, to be averaged among them and not to be calculated on the maximum demand of the individual consumer. To a certain extent the maximum demand of each consumer will influence the size of pipe laid in his immediate vicinity, but this is comparatively such a small matter that it would not seriously affect the amount of the figure derived above.

It is rather difficult to figure the extra cost of maintenance involved by a street main system of an average of 6-inch pipe instead of one of the average of 3-inch pipe. Under ordinary conditions the cost of street main maintenance depends largely upon circumstances the effect of which is not increased by increase in the size of the pipe, and in many systems the greater part of the cost of such maintenance is due to breaks in the pipes smaller than 4 inches in diameter, and on the whole the cost of maintaining the 3-inch system would probably be fully as great as that of maintaining the 6-inch system, so that this then will not influence the total.

In determining the extra cost of this service pipe involved by the excess of the maximum demand over the average demand it must be remembered that other considerations besides the amount of gas to be carried have a great influence upon the size of the pipe that is to be laid in any given case. There is no need to go into these considerations in detail, but the practice in laying service pipes to street lamps, which furnishes a case of uniform consumption without any expectation of future increase, may be taken as sufficient proof that under no conditions would a service be laid of pipe smaller than ¾ inch in diameter. Some companies, in fact, lay no lamp-post service smaller than 1 inch. The excess investment occasioned by the maximum demand of the consumer may, therefore, be taken only as being the difference in cost between the size of the service actually required and the minimum size, ¾ inch, that would be laid in any

case. This extra investment has, of course, to be figured for the original consumer, but for the purpose of this paper a consumer with a maximum demand of 80 cubic feet per hour will be taken. Such a consumer could be supplied with a 1-inch service, but most gas companies would lay a 1¼-inch service, and the excess investment occasioned by the maximum demand may be taken as the difference in cost between a 1¼-inch and a ¾-inch service. This difference in cost will be practically the difference in the cost of the pipe and fittings used, since the laying of a ¾-inch service would call for as much labor as the laying of a 1¼-inch service. Taking the low discount of 66 per cent. from list prices, the difference in cost between 1¼-inch and ¾-inch pipe will be 3.75 cents per foot. With an average length of service of 70 feet, this difference in cost of pipe, combined with the difference in cost of the fittings, would make the larger service cost say $2.80 more than the smaller service. If a stopcock is provided at the curb, 45 cents must be added for the difference between a 1¼-inch and a ¾-inch cock, making the total excess cost of the larger service $3.25. Interest and depreciation on this at 10 per cent. would be 33 cents per year. The difference in cost of maintenance between one service and the other is practically negligible, as in the case of the street mains.

In the case of meters there must be taken into consideration the question of whether a meter smaller than the present 3-light would be any cheaper than one of that size, and the meter manufacturers would probably agree that practically nothing could be saved in cost by going below the present 3-light size. The extra investment in consumers' meters involved by the maximum demand of the consumer is, therefore, only the excess cost of the meter actually set over that of a 3-light meter. For a maximum demand of 80 cubic feet per hour, a 5-light meter is ample. This will cost, unset, $1.40 more than the 3-light, and with a liberal allowance for the extra cost of connections and setting, the extra investment occasioned by the maximum demand would not be above $2 for this class of consumer. Taking interest and depreciation at 15 per cent. in this case, on account of the life of the meter being shorter than that of the manufacturing apparatus, street mains and services, the maximum demand charge on account of meters for the case named would be 30 cents per year.

While it is rather difficult to name exact figures for the extra cost of maintenance involved by the necessity of using a 5-light instead of a 3-light meter, 10 cents per meter per year would seem to be a very liberal allowance.

Summing up the various charges as determined above, we have the total maximum demand charge per year for a consumer with a demand of 80 cubic feet per hour:

Manufacturing plant, including holders	$2.50
Maintenance on above	.30
Street mains	1.33
Services	.33
Consumers' meters	.30
Maintenance of consumers' meters	.10
	$4.86

An effort has been made to have these figures err on the high side instead of on the low side, and in many cases it will probably be found that $4.75 would be an ample maximum demand charge for a maximum demand of 80 cubic feet per hour. If this charge varied in exact proportion with the variation in the maximum demand, this would make a charge of about $6 for a maximum demand of 100 cubic feet per hour.

The items of cost to be included in a consumer's charge would be: Complaint expense; gratuitous work; repairs to services; repairs to meters, less the amount of such repairs taken care of in the maximum demand charge; setting and removing meters; expense of collection; cost of consumers' ledgers; car fare for meter readers; gas bills; expense of reading and indexing meters; salaries of bookkeepers on consumers' ledgers, of bill clerks, and of cashiers; interest and depreciation on the cost of service of the size required to furnish gas at the average rate; interest and depreciation on the cost of a meter of the size required to furnish gas at the average rate.

The items made up of the cost of labor and materials will vary with each company, and will have to be determined by each company for itself, but it is probably safe to say that they will not exceed, in any well-managed even though comparatively small company, $2.50 to $3 per consumer, where, as would be the case with this system of charging, it would only be necessary to set one meter per consumer. The higher figure may be taken for the purpose of this paper.

It was determined in dealing with the maximum demand charge that a ¾-inch service may be taken as the size required to supply the average demand of the ordinary consumer, and the cost of such a service of an average length of 70 feet should not be more than $8. Interest and depreciation at 10 per cent. will give a charge for this item of 80 cents per year.

It was also determined that the cost of the meter required for the average demand of the ordinary consumer might be taken as equal to that of a 3-light meter. The interest and depreciation on such a meter may be taken as $3 per year. The total consumers' charge would therefore be:

Expense for labor and material....	$3.00
Interest and depreciation on cost of the service	.80
Interest and depreciation on cost of the meter	1.00
	$4.80

The charge per 1,000 cubic feet of gas used, to be made in connection with these maximum demand and consumers' charges, would be such as to cover all the operating expenses not specifically assigned to one or the other of the latter charges and the profit which the company is entitled to make. This charge per 1,000 cubic feet must be determined separately for each company and cannot be made the subject of a general discussion.

It may be argued that the demand and consumers' charges should be made sufficiently high to cover a portion of the profit, but such a course would not conform to the requirement that no greater profit be made off of one consumer than is made off of another when the same service is rendered to each. The maximum demand and consumers' charges make each consumer pay the cost of everything that is furnished him except that of the gas which he uses, and, therefore, the unit of service which is common to all cases after these charges have been made is the delivery of 1,000 cubic feet of gas, and all the profit must be included in the cost of this unit if it is to bear equally upon all consumers.

This system of charging has been applied, as far as the consumer's charge is concerned, in the case of one small gas company, and each of its consumers pays 25 cents per month as a fixed charge, irrespective of the amount of gas consumed, the bills rendered carrying the two items of "gas consumed" and "fixed charge." Many of the consumers use only small amounts of gas, and without this fixed charge would be a source of loss to the company, but with it they pay their own way. By the action of this charge the price paid for gas is automatically reduced as the consumption increases, the consumer of less than 1,000 cubic feet per year paying at the rate of $5 per 1,000 cubic feet, while the consumer who uses the largest amount of gas obtains it at a total price of $1.75 per 1,000 cubic feet. The conditions of manufacture and distribution are such that the equitable maximum demand charge would be very small, and it was not considered advisable to make it as a separate item. The consumer's charge is probably too small for present conditions, but the services are short and the district very compact, and as the business is developed this charge should prove adequate. If it does not, a change can be made at the proper time, accompanied by such a reduction in the price per 1,000 cubic feet of gas that the total charge to consumers of small amounts will remain practically as it is at present, while the consumers of large amounts will obtain a substantial reduction. After an experience of 18 months of this method of charging, the managers of the company are entirely satisfied that both the consumers and the company are better off than would be the case were the charge for gas simply a uniform price per 1,000 cubic feet.

Believing firmly in the justice, and, therefore, the policy of a method of charging for gas that will make each consumer pay his share, and no more than his share, of the expenses and the profit of the gas company serving him, I hope that this paper will aid the doing away with the present method of charging, under which form 20 per cent. to 25 per cent. of the consumers are served at an actual loss to the company, and an additional 35 per cent. to 40 per cent. do not return their fair share of the profit, while the remainder return an excessive profit.

Reinforced Concrete Withstands Earthquake and Fire.

The California representative of the St. Louis Expanded Metal and Corrugated Bar Company, Mr. John B. Leonard, M. Am. Soc. C. E., has carefully investigated the ability of the various building materials to withstand the severe shocks from the San Francisco earthquake, with the succeeding conflagration adding its injurious effect, and a telegram from him states unequivocally that reinforced concrete made a wonderfully satisfactory showing. Mr. Carl Leonardt, of Los Angeles, perhaps the most prominent contractor in southern California, after making a tour of inspection, sends a telegram to the same effect. There have been rumors that concrete had again demonstrated its value, but these are the first definite and reliable reports that reinforced concrete had successfully passed the combined effects of severe shaking by earthquake and extensive conflagration.

Kansas Paving Petitions Must not Name Specific Kinds of Paving Materials.

In a decision handed down by Judge Doster all of the paving petitions which have been acted upon by the City Council of Topeka, Kan., this year, covering thirty-three blocks, are invalid. Judge Doster holds that the recent decision of the Supreme Court declaring a paving contract at Kansas City, Kan., invalid for the reason that it specified a certain kind of paving brick, applies to Topeka paving contracts. The Topeka petitions all specified Shawnee county brick and Fort Scott blue sandstone curbing. When the specifications for the pavement were drawn and the advertisement for bids was published this feature was eliminated, and it was thought that this would offset the defect of the petitions, but Judge Doster holds to the contrary, saying that the petitions govern the case.

The Cement Industry in 1905.

A preliminary statement on the production of hydraulic cement in the United States during the calendar year 1905 has been issued by the United States Geological Survey. It shows that the total production of all kinds of hydraulic cement in 1905, including Portland, natural-rock, and slag or Puzzolan cements, was 40,894,308 barrels, valued at $36,012.189. This was an increase of 9,219,051 barrels, valued at $9,980,269, over the production of the previous year.

Of the total amount of cement manufactured in the United States in 1905, 36,038,812 barrels were Portland cement, with a value of $33,326,523; 4,473,049 barrels were natural-rock cement, valued at $2,413,052; and 382,447 barrels were slag or Puzzolan cement, valued at $272,614.

As shown on page 230 of the March number of MUNICIPAL ENGINEERING, the exports of domestic cement were 211,000 barrels more than the amount of foreign cement used in this country, an amount which is practically negligible, so that the entire 36,000,000 barrels of production may be said to have been used at home.

Judgment in Ohio Bridge Cases.

Judgments were awarded to H. L. Stewart, K. F. Briggs and Kay Monett, taxpayers of Fremont, O., April 2, in their suits against the Massillon Bridge Company for bridges alleged to have been illegally sold in Crawford, Erie and Seneca counties. The judgments aggregated $65,670.

MUNICIPAL AND TECHNICAL LITERATURE

Municipal Reports—New Publications.

Municipal Reports.

Eleventh Annual Report of the Board of Public Works and Water Commissioners of Little Falls, New York, 1905. Silas S. Feeter, City Engineer.

While the report gives all the receipts and expenditures of the city in detail it is apparently not possible to get a detailed classification of the items that one may know what was the reason for the expenditure. The account with the treasurer classifies the expenditures under the headings "Contingent," "Park and Cemetery," "Highway, "Waterworks," and there is a special account of "Paving Fund" receipts and expenditures with totals of over $40,000 each concerning which there is no detailed information. The city engineer's report says that "the past year shows no extension of pavements" and it is necessary to go to the report for 1904 to find that in that year there was a considerable increase in the amount of paved streets, "a trifle over one and one-half miles." It is presumable that the payments made at intervals during 1905 are for the pavements reported as laid in 1904, but there is no definite statement regarding this, regarding the amounts of the contracts or the exact nature and extent of the work.

The report is therefore not of much value to one unacquainted with the detail of the work.

The water department is now furnished with rules and regulations for the protection of the purity of the supply from Salisbury reservoirs, imposed by the State Board of Health. The 20-inch vitrified pipe conduit is being gradually replaced with iron pipe, about 1,000 feet being relaid in 1905. There is much complaint of waste of water in both summer and winter and the Spruce Creek, extra, supply was in use most of the year.

Two short new sewers were laid and three old ones relaid and the city now has over 12 miles of sewers.

The city now owns its own stone crusher and road roller and repairs streets and builds new macadam streets. On Loomis street 2,300 feet of new street was made at a cost of $1,122, or at the rate of $2,537 a mile. The state road adjoining cost $8,908 a mile and the city engineer thinks the city work compares favorably with it At present the road roller engine runs the crusher, so that both cannot be doing their appointed work at the same time.

Annual Report of the City Comptroller of the City of St. Paul for 1905. Louis Betz, Comptroller.

The thorough classification of accounts makes this report a pleasure to examine. The order of the board of aldermen to omit the printing of the detailed statements of items makes the book much less bulky than it was prior to 1904, and to the ordinary student of city affairs it is quite as useful. The details are thoroughly classified and are accessible to any one at the comptroller's office. The totals and the classifications appear in the report.

The detail statement of cash receipts shows the receipts for each of the city funds, the various classes of licenses, courts, markets, clerk, rents, vacations, etc., special interest, school, library, fire, police, health departments, streets, sinking, boulevard funds, etc., gradings, pavings, sewers, improvements, openings, walks, parkways, etc., in sufficient detail to give full value. The disbursements are equally well reported. Each of the major funds has a separate account showing still greater detail, such funds as waterworks, fire department, police department, lighting fund, water supply fund for public purposes, school fund, workhouse, city officers' salaries, funds of various boards, street and sewer, bridge repair, etc., etc., being included.

A few figures may be of interest, selected somewhat at random.

From the lighting fund account and a note at the bottom of the page it is noted that 3,222 incandescent lamps cost $26.25 a year each; 1,950 incandescent gasoline lamps, $24.96; 74 underground wire electric arc lamps, $100; 590 overhead wire electric arc lamps, $90 a year each; and 65 park electric arc lamps $8 a month each and that the total payments were for 1905 for gas $43,966, for maintaining gas lamps, $37,988, for electric lights $57,035, for gasoline lights $60,318.

Maintenance of water works cost $58,767; connections cost $42,800; meters cost $27,372; extensions cost $66,564; construction cost $4,269; interest on bonds was $109,245.

City salaries amounted to $46,324, the mayor's being $2,500; councilmen, $100; comptroller, $3,500; treasurer, $4,000; clerk, $3,000; attorney, $5,000; market master, $1,000. The Board of Public Works fund pays its own salaries, amounting to $12,000; the commissioner of public works pays his own salary and office force $29,107; and each other fund pays its own officials and employes, so that the city salaries fund only pays those salaries which cannot be charged directly to definite funds.

Garbage collection cost $19,879, with $1,600 added for removing dead animals and $3,793 added for salaries of superintendent and inspectors. Garbage sold brought $1,616.

An account not usually published in municipal reports is the contingent account showing donations and expenditures for entertainments and junkets, ranging from $25 for entertaining Spanish War Veterans to $2,500 for the Northwestern Saengerbund, and amounting in all to very nearly $10,000.

Asphalt repairs on streets not under guarantee cost $10,295.

Recapitulations in the second part of the report show the total of ordinary and extraordinary expenditures for each department, general administration, public safety, public charities and correction, public highways and sanitation, public education and libraries, public recreation, municipal enterprises, public debt and miscellaneous. The grand totals are $2,208,004 for ordinary expenditures, $472,083 for public debt, all but $34,381 being for interest, and $573,376 for extraordinary expenses, including construction of fire engine houses, armory, hospital, streets and sewers, bridges, school buildings, parks, baths, playgrounds, water works construction, public market, purchase of assessment certificates and aid to cyclone sufferers. A large table

compares the totals of these various funds for the past eleven years.

Assessed valuation, bonded indebtedness, property exempt from taxation, $11,000,000, of which $2,000,000 belongs to the city, are shown in detail with comparisons with previous years; also the list of corporate property, interest-bearing debt, bonds issued and purpose, interest paid, tax levy certificates, and sinking fund accounts.

So much space is occupied in a statement of what this report contains because if every city should adopt a similar form there would be less opportunity for funds to be diverted to other purposes or out of the municipal channels, and this report itself may well serve as a model for the financial part of a municipal report.

Twenty-first Annual Report of Board of Water Commissioners, Norfolk, Va., 1904-5. R. Henry Jones, Superintendent.

The new administration for which this is the first report seems to have made quite a thorough house-cleaning. An investigation by the fire chief showed a large number of defective fire hydrants. The use of hydrants by unauthorized persons seems to have been the cause of much deterioration of hydrants and consequent expense. There is great scarcity of gate valves, making necessary shutting off large sections of the pipe system for single breaks or connections. These conditions have been materially improved. Insurance to the amount of $150,500 was put on the pumping station and apparatus for the first time. The artesian well was examined and, the water proving unfit for domestic use, it was cut out of the supply. Since the new 30-inch main was completed, early in 1905, the pumpage has increased from 5,800,000 to 7,500,000 gallons a day, but the amount of coal used has decreased about 20 per cent. An expert accountant examined the books of the department in 1904 and has materially modified the statements of resources and liabilities from those previously made. The plant has cost $858,863, the principal items being $54,927 for buildings and grounds, $105,401 for machinery, $353,830 for sources of water supply, $277,825 for mains. The outstanding bonds are $850,000 and the cash on hand at time of report was $56,943. This reduces the surplus as shown by previous reports by $469,150, the amount charged off on value of construction being $352,731 to make the statements agree with the present value of the plant. Reasons are given in detail for each item charged off or increased, and nearly all of them may be classified under depreciation and entries under wrong headings.

Annual Report of the Auditor of Pasadena, Cal. 1905. Geo. F. Kernaghan, Auditor.

Pasadena has a new city hall, for the building of which $49,500 of bonds were issued in 1902, but its value has not yet been added to the statement of city property.

The auditor's report is very commendable for its clear and detailed classified statements of receipts and expenditures for the various funds and departments. The report is as complete as that of St. Paul, which is unusual for one of the smaller cities.

Some of the more important funds show the following: Street intersection paving, sidewalks and sewers are paid by the city and the amount paid for the year of the report was $22,455, about 80 per cent. of the amount being for three street improvements. The receipts from the sewer farm were $10,583, the principal crops being walnuts, for which $6,900 were received, and hay, for which $2,389 were received. The cost of running the farm was $7,958. This amount includes $5,300 for labor, $800 for horses, and all items such as supplies, seed, veterinarian, insurance, tools, freight, feed, etc. The cost of 160 acres of the farm purchased during the year was $12,000, making the area of the farm now 460 acres, valued at $230,000. The auditor's department cost $5,092, of which $1,200 was his salary. The city engineer's department cost $8,754, of which $1,614 was his salary, and he collected from various sources $3,375 to credit on the account, leaving the net cost of his department only $5,400. Street lighting cost $14,179. Street sprinkling cost $11,669, of which $2,448 was for water. The street department spent $31,738. Approximately $5,400 of this was labor and materials for oiling streets; $8,500 for cleaning streets; $5,500 for salaries. Interest on bonds amounting to $10,870 and $11,300 of bonds were paid during the year.

The city engineer receives the largest salary of any city official except the superintendent of schools.

The sewer farm will be considered more in detail later.

New Publications.

Sewerage and Sewage Purification. By M. N. Baker. Second edition, revised and enlarged. 153 pp., 50 cents. Van Nostrand's Science Series. D. Van Nostrand Company, 23 Murray street, New York City.

Mr. Baker has quite thoroughly revised this little book, first issued over ten years ago, and he has brought it down to date.

It is the most satisfactory small book on the advantages of sewerage and the steps proper to take in establishing a system, and is an excellent advocate, whose judgment can be understood and appreciated by the average councilman or member of board of public works or of health.

The reasons for wanting a sewerage system, its value, the necessity of good engineering advice, a good program or procedure in securing engineering reports and plans, methods of meeting the cost, the requirements to be met in a final set of plans and specifications, proper methods of securing bids, awarding and executing contracts are all clearly and briefly set forth.

Quite a number of details of the design, such as are usually first considered by the non-technical city official, are discussed, such as the procedure of the engineer in designing and constructing the system, the manholes, grades, flushing, house connections, ventilation, catch basins, storm overflows, pumping, tidal chambers. The question regarding separate and combined sewers is also discussed to some extent, to show the principles on which the choice of a system for a given locality should be based. The operation of the completed system and the qualifications desirable in members of a sewer board are also considered briefly.

About one-third of the book is devoted to a brief enumeration of the claims of the various methods of sewage purification, old and new, including sedimentation, mechanical straining, chemical precipitation, the septic tank, artificial aeration, sewage farming, sub-surface irrigation, intermittent filtration, contact beds and percolating filters.

The non-technical municipal official will get a clear and a comprehensive idea of the problems involved in sewerage and sewage purification, and the engineer ought to be able to use the book to advantage in his campaigns of education where sewerage systems are needed, and the decisions regarding action must be made by men ignorant of the subject and of the sanitary necessities of their municipalities.

Municipalizzatione dei Servizi Pubblici. By C. Mezzanotte. 324 pp. Cloth. 3 lira ((60 cents). Ulrico Hoepli, Milan, Italy.

The laws and regulations established to govern the assumption of municipal public services by the city officials are arranged by the author, the regulations being classified under the sections of the law upon which they depend. He then gives explanations of the intent of the laws and regulations and hints as to details of procedure.

The first section of the law mentions as subject to municipal ownership and operation the following industries: Water supply; lighting, both public and private; sewers and sewage disposal; street railways; telephones within the municipality; pharmacies; garbage removal and street cleaning and disposal of the refuse; funerals, which may be assumed exclusively by the municipality, except in case of members of congregations, fraternities or associations legally authorized; ordinary mills and bakeries; slaughterhouses, which may be monopolized by the city; markets, also possible city monopolies; baths and lavatories; ice factories; night refuges; systems of omnibusses, automobiles and similar methods of public transportation; hydraulic and electric power stations; bill posting, except of electoral and other governmental notices; drying and storage of corn; nurseries and storage of grape vines and other trees and fruit-bearing plants; and refers to other rights granted by other acts passed prior to the law under consideration, which is dated March 29, 1903, such as fire insurance, establishment of factory sites, establishments for making and selling cheese, wine and oil; lumber manufacture; control of bridges, streets, harbors and other public works; insane and other hospitals; recovery of taxes on consumers, duties and the taxes levied on property, etc.

The law and the regulations go into detail regarding the establishment of the boards of directors and the methods of taking charge of the various industries, and give the duties of the officers and other persons engaged in the business. The referendum is provided for in deciding upon the assumption of a public service by the municipality. Approval of the accounts and appropriations by the city council and the provincial administrative council is provided for. The governor of the province also has certain powers in regulating the operation of the industry. Adjoining corporations can join in operating a system.

A study of the book shows many valuable features which might well be adopted for use in the United States.

A Handbook for Superintendents of Construction, Architects, Builders and Building Inspectors. By H. G. Richey. 742 pp. 357 figures. Morocco. $4. John Wiley and Sons, New York.

Mr. Richey is a superintendent of construction of buildings under the United States government, and this book is the result of his experience. It necessarily runs parallel to a portion of Kidder's "Architects' and Builders' Pocketbook,"

but is not half as large. It goes into more detail regarding the methods of construction of which it treats than the larger book and may, perhaps, be better for the inspector or superintendent of construction on this account. It contains much of the building regulations of the largest cities in the United States and of the National Board of Fire Underwriters.

The various parts or chapters treat of the personality and duties of the superintendent and follow the construction of a building through excavating, foundations, piles, stone qualities, cutting, laying and setting, marble and slate work, brickwork, paving, concrete and its ingredients, terra cotta, fireproof construction, lathing and plastering, carpentry, plumbing, sheet-metal work, painting, glazing and paper hanging, iron work, electrical work, and heating. There are also chapters on drawing and laying work, and giving data on hydraulics, strength of materials, etc.

The book is put up in the excellent style which one expects of its publishers and will be found valuable and interesting.

Roster of City Officers of the State of Indiana. 24 pp., paper, 50 cents. John F. Taggart, Richmond, Ind.

Mr. Taggart, who is the secretary of the Municipal League of Indiana, has prepared this list of the city officers of Indiana for the members of the league and the city officers, and can supply a few copies to others at the price named.

Gas, Gasoline and Oil Engines, Including Producer Gas Plants. A new complete and practical work on gas, gasoline, kerosene, and crude petroleum oil engines, including producer gas plants for gas-engine owners, gas engineers and intending purchasers of gas engines, fully describing and illustrating the theory, design, construction and management of the explosive motor for stationary, marine, and vehicle motor power. Including a list of United States patents issued on the gas engine industry to the present time. By Gardner D. Hiscox, M. E. 442 pp. 351 engravings. Cloth, $2.50 net. The Norman W. Henley Publishing Co., 132 Nassau street, New York City.

The fourth edition of this book was reviewed in MUNICIPAL ENGINEERING, vol. xxiii, p. 130, to which reference may be made for points not considered here. This is the fifteenth edition and is said on the title page to be "a new book from cover to cover, entirely reset, revised and enlarged.

The restrictions regarding the theoretical parts of the book which were made in the earlier review are most of them applicable to the present edition. One or two of the instances of confusion of percentages and hundredths have been corrected, but most of them stand in the erroneous form of the fourth edition. There have been some additions to the information given in the theoretical chapters, such as the development of gasoline and alcohol as fuels, but no material improvements in the manner in which the subject is treated.

When the chapters on practical details are reached, however, there is a material improvement, keeping pace with the advances in this class of motors. Thus the chapter on carbureters is increased 50 per cent., that on cylinder capacity by a like amount, showing the improvements in appliances and in design which have come from the concentrated experience of the past five years or so. There are many new chapters made partly by dividing the chapter on types of engines into several sections entirely rewritten and partly by adding chapters on such subjects as constructive details and parts, dimensions, and producer gas and its production.

There is but little system in the collection of the subjects into chapters. Thus motor-cycles is the subject of a paragraph in the chapter on explosive motor dimensions; vibration of buildings is a section of the chapter on the measurement of power; and many chapters have similar anomalies of arrangement.

Many of the plates in the older edition have been redrawn for the new edition and many more have been added, making a very valuable and excellent collection of detail drawings and perspectives of machines, and of their parts. The new edition has larger type, better paper and better presswork and is in almost every way a material improvement over the former editions. The fact that this is the fifteenth edition is proof that the book meets a large demand with success.

Beton Kalender. Pocket Book of Concrete and Reinforced Concrete. 600 pp. 650 illustrations. 3 marks (60 cents). Issued by "Beton und Eisen." Berlin, Germany, Wilhelm Ernst & Sohn.

The first 200 pages of this book contain the usual calendar information regarding geography, telegraph and postal rates, conversion tables for weights, measures and money, and mathematical tables, geometry, mensuration, strength of materials, and especially of cement concrete and mortar, with methods and proportions of mixing and descriptions of machines for mixing. The second part, 340 pages, is composed of treatises on concrete foundations, concrete walls, plain and reinforced hollow and solid, monolithic and block, pillars, reinforced concrete beams, by F. von Emperger; floors and ceilings by R. Janesch, with descriptions of many special systems of construction of reinforced concrete and other fireproof floors;

roofs and skylights by Ed. Ast; stairways by F. von Emperger; building construction by O. Rappold; reinforced concrete culverts and bridges by E. Luipold and S. Zipkes; arches by J. Melan; factories, silos, theaters, chimneys, street paving, river bank protection, sanitation of cities, water supplies, storm sewers, dams, reservoirs, water power installations, covered reservoirs, artificial stone, by various authors, with special reference to the use of cement and concrete therein. The third part, 70 pages, gives many figures of cost of the various kind of work described in the previous part; building regulations; standard specifications for testing and use of cement; the German patent regulations; locations of testing laboratories; lists of books and periodicals on cement and concrete and construction.

There is no such full collection of such data in English at many times the price.

Concrete-Block Houses, a Portfolio of Designs of Concrete-Block Houses. 26 sheets. $1. Henry Wittekind, architect, Chicago, Ill.

This is a portfolio of architectural designs for small houses and cottages, to be executed in cement blocks, and of which Mr. Wittekind proposes to furnish plans and detailed specifications. There is an open field for a well-equipped, serious-minded, well-trained architect who will take up the consideration of cement-block dwellings and other structures. It is of primary importance that these designs should be the conception, primarily, of an artist. It is imperative that the sense of the beautiful be a dominant feature of his personal makeup. Following this there should be the practical sense which would enable such a one to express his sense of the beautiful through the medium of the cement block. There is no reason why the cement-block house should not be beautiful, should not have back of it the artistic instinct. The cement block inherently has the same relation to building that any other block has, be it of brick, stone or terra cotta. It is not the fault of the cement-block idea that so many of the houses built with it are so irredeemably ugly. It is the fault of the cement-block designer, of the one who conceives the forms, who makes the drawings. With an ugly design expressed on paper, no amount of good construction, concrete composition or handicraft will produce a beautiful structure. An ugly design, one conceived in a crude spirit, necessarily implies the homely, crude structure. There is nothing for which the cement-block industry is suffering so greatly as good designs, adapted to the machine-made forms of the cement-block maker.

We are looking anxiously for the publication of a work which will do what Mr. Wittekind's little portfolio proposes to do—that is, present plans for cement-block structures which will be a credit to the cement-block industry. As it is, those who build under an implied promise of artistic excellence would be disappointed and the cement-block industry receive a corresponding backset.

ORGANIZATIONS AND INDIVIDUALS

National Civic Federation—League of American Municipalities—Nebraska Cement Users—Municipal Electricians—Brick Manufacturers—Technical Meetings—Civil Service Examinations—Municipal Elections—Personal Notes.

Meeting of National Civic Federation Committee.

The committee of the National Civic Federation met in Chicago April 6 to hear the report of the experts who have been studying Chicago's efforts at municipal operation of public utilities for more than a month.

The members of the committee who met in Chicago are:

Prof. Frank J. Goodnow, Columbia University, New York city.

Walton Clark, third vice-president of

the United Gas Improvement Company, Philadelphia, Pa.

Edward W. Bemis, superintendent of water works, Cleveland, O.

John H. Gray, professor in Northwestern University, Evanston, Ill.

Walter L. Fisher, Chicago.

William J. Clark, general manager foreign department General Electric Company, New York city.

Frank Parsons, president National Public Ownership League, Boston, Mass.

F. J. McNulty, president of the International Brotherhood of Electrical Workers, Washington, D. C.

Charles L. Edgar, president of the Edison Electric and Illuminating Company, Boston, Mass.

Edward A. Moffett, secretary of the committee, editor of Bricklayer and Mason, Indianapolis.

The experts who presented their report were Theodore Stebbins, Columbus, O.; Professor Gray and E. C. Phelps, Jr., Baltimore, Md., on electric light, and Dabney H. Maury, of Peoria, on water works.

League of American Municipalities.

The next annual convention of the League of American Municipalities will be held in Chicago September 26 to 29, 1906. It is the desire of the league to make this the greatest convention of mayors, councilmen, other city officials and students of civic affairs ever held in this country. In this effort the league is supported by the City Council of Chicago, which body has passed a set of resolutions cordially inviting the business interests throughout the country.

The Nebraska Cement Users' Association.

At Norfolk, Neb., Feb. 2 and 3, 1906, a local organization of cement-block makers was formed and during the following week a larger number gathered at Grand Island, Neb., and formed the Western Cement Users' Association, with twenty-five members to begin with. During the third week in February a third meeting was held at Lincoln, Neb., and after some discussion a new State organization was formed, which the earlier organization joined in a body, thus starting the association with a membership of eighty. H. Graham, of Lincoln, was elected president and J. R. White, of Elm Creek, secretary.

At the Grand Island meeting Professor Thomas, of Kearney, Neb., was the principal speaker, and at Lincoln President Richard L. Humphrey, of the National Association of Cement Users, rendered efficient service.

While the object of the association is mutual benefit in all directions, the special factor in its beginning was the problem of securing cement as cheaply as neighboring States can get it, conditions as to freight rates and methods of distribution being similar, but prices being considerably higher. It is reported that by the car Nebraska cement users are required to pay from $2.40 to $3 a barrel. We are indebted to W. F. Roney, of Grand Island, Neb., who was secretary of the Western association, for a report of the formations of the organizations.

The present organization is known as the Nebraska Cement Users' Association. Following is a list of the members, all being makers of concrete blocks except those designated as agents:

J. M. Erickson, Donneburgh; A. O. Thomas, Kearney; L. Schmidt, Grand Island; Joe Friend, Miller; R. B. Smith, Lexington; J. A. Beebe, Kearney; W. B. Elmer, Indianola; Knutzen & Irdell, Kearney; T. J. Quail, Miller; C. J. Arnbury, Holdridge; E. C. Rheinhart, Aurora; C. B. Helling & Son, Grand Island; W. Lewis, Caloway; F. Berger, Hastings; Thrailkill & Sadler, Litchfield; F. W. Studebaker, Red Cloud; T. Whalen, Wood River; Baker & Ohara, Grand Island; C. D. Green, Bayard; C. R. Tritt, Shelton; C. W. Griswold, agent; W. F. Roney, Grand Island; A. C. Holingworth, Beatrice; S. H Manon, Beatrice; Miles Brown, Sutton; E. H. Thompson, University Place; Ed Baleman, Beathney; W. H. Morse, Ord; G. W. West, Seneca; S. H. Guye, Arcadia; R. C. Hewer, agent; H. M. Davenport, Lincoln; C. T. Ruthman, Valparaiso; C. H. Buck, DeWitt; F. A. Lee, Benton; E. J. Scott, Columbus; J. E. Watenpaugh, Western; J. S. Blackman, Beaver City; A. L. Ramond, Creighton; T. C. Daugherty, Auburn; J. A. Free, Lincoln; F. E. Holden, Stromsburg; T. J. Brenton, Neligh; A. G. Wombach, Omaha; C. R. Telmack, Cook; A. J. Russell, Minneapolis; A. J. Hebb, Lincoln; D. C. Turner, Cresco; R. T. Davis, Geneva; H. S. Krolon, Verdel; O. Heystrom, Cresco; H. H. Stottka, Fairmont; W. F. Frazer, Lincoln; J. S. Craven, Exeter; J. R. White, Elm Creek; J. S. Gones, machines; C. R. Wilson, agent, Lincoln; J. M. Krieger, Rising City; A. E. Speder, Shelley; Cambridge Concrete Co., Cambridge; J. B. Sedgwick, York; D. Thompson, Caro; E. E. Cook, Cazad; Newton B. Smith, Lexington; S. J. Chambers, Hastings; J. Powers, Miller; R. Wilkerson, Brewster; L. E. Porte, York; F. W. Carlin, Ainsley.

The International Association of Municipal Electricians.

The eleventh annual convention of this association will be held at New Haven, Conn., August 15, 16 and 17, 1906. At this meeting the following papers will be presented and discussed: "History of the Fire Alarm and Police Telegraph," "Details of Certain Auxiliaries to Fire Alarm Apparatus," "Advisability of Protecting Municipal Electricians by the Civil Service Laws," "Comparison of Underground and Overhead Wiring and of the Relative Values of Single Rubber-covered Wire and Lead-encased Cable for Underground Construction," "Conditions Surrounding the Inspection of Wires in the Southwest."

In addition to this the question box will be a feature at this meeting.

National Brick Makers' Association.

The twentieth annual meeting of the National Brick Manufacturers' Association was held at Philadelphia February 7, 8 and 9. Among the papers submitted during the convention was one by Charles J. Deckman, of Cleveland, O., entitled "The Permanent Improvement of City and Country Roadways," in which he said:

The construction of brick pavements, to combine all the essential qualities, particularly durability and economy, may vary in different localities under different conditions. In the city of Cleveland we have the finest roadways in the world, paved with brick. On a recent visit to Cleveland of a leading civil engineer of one of your prominent Eastern cities he made this remark: "I have seen many miles of paved brick streets, but to-day I have seen the first brick-paved streets."

The character of the brick pavements referred to differ only as to foundation. In the major portion of these improvements the foundation consists of sand, which is the natural soil, and, after such preparation as is required under the specifications, the roadway is paved with brick, inspected, rammed, rolled, grouted with a cement grout filler, covered with sand and the improvement closed to traffic until the same has had time to set properly, and the roadway is then thrown open to traffic as a finished pavement, and this is the kind and character of brick-paved streets—most largely used in the residence districts—and which, while not better than the best, are better than the rest. The improvement of heavy-traffic streets differs only in that a concrete foundation is used instead of sand, and in each case the same smooth, beautiful, durable, substantial and economical results are obtained.

These same results may be obtained in any section of the universe under like conditions. Foundations for improvements cannot be too good, yet many civil engineers, in localities where conditions heretofore referred to exist, do not know the difference between a natural soil that will produce a lasting and economical foundation and an uncalled-for expensive foundation of crushed stone, slag, cinders or concrete, when the absence of which would lessen the cost and at the same time produce the results most desired—durability, beauty, economy.

I would not have it said or understood that I am not in favor of good foundations, but it is a well-known fact that many thousands of dollars are frittered away in providing for substantial stone or concrete foundations because it has been the civil engineer's idea—when a most thoroughly substantial and satisfactory pavement has been laid by the contractor with from 25 to 75 per cent. of the proposed expensive foundation eliminated from the work, yet paid for by the taxpayer—and all because the contractor knew from a practical knowledge the results to be obtained from the material at hand better than did the civil engineer.

Under this argument and with these methods, with practical, efficient officials, we, in Cleveland, have the best paved streets in the world.

In that vicinity are manufactured 75 per cent. of all the paving brick and block manufactured in Ohio, and all the reputable manufacturers are producing material of satisfactory service and quality, and this has been brought about by the competency of the manufacturers and efficient inspection, both at the plants and on the work.

With reference to our country roadways, we have in Cuyahoga county 100 miles of brick-paved roadways, varying in width from twelve to thirty feet. These roadways are constructed largely on one side of the highway, the other side being a dirt roadway on an even grade with the paved portion. The nature of the soil in the majority of these country improvements is of clay, and upon the sub-grade is laid a crushed stone or slag foundation eight inches deep, the preparation of which is in common with all similar foundations. All the proper under-drains, retaining curb, etc., bring us to the paving of the roadway with brick. The brick are laid, inspected, rolled, grouted with cement grout filler and the pavement covered with sand and closed to traffic for ten days, when the same is opened as a finished piece of roadway for public use.

The brick or block used are what are known as "lug block," there being one-eighth-inch projections on the four corners of one side of the block about three-fourths inch from the face of the block and about one and one-fourth inch from each end. These lugs are often made of raised letters, which form the lugs and the name or brand by which the block is known on the market. The object of these lugs is to permit the cement filling to reach the bottom of each block and form a bond uniting the entire surface of the paved roadway into one unbroken plane.

The ways and means for constructing these country roadways are provided by a uniform State law, affecting all roadways in every county in the State and authorizing the county commissioners to build them and distribute the cost by assessment against the abutting and all other property in the county in such fixed ratio as seems for the county's best interests.

The cost of these brick-paved roadways, averaging sixteen feet in width, is about $20,000 per mile. The cost of those in the city on sand foundation is from $1.15 to $1.25 per square yard, and from 50 to 60 cents additional for concrete foundation.

In what I have said regarding brick

pavements or their construction it has not been my purpose to define or point out the specific manner of construction. You all well know how there is no better foundation than concrete, and the opinions of civil engineers of the proportions of material to compose the best concrete are about as numerous as the parts themselves. I do believe, however, that a uniform specification should be adopted for brick-paved roadways. By this I do not mean that every brick pavement should be laid on a concrete foundation, but that every foundation, of whatsoever kind, should be uniform and of the best of its class, and this be the uniform foundation for brick under that class.

An invitation from St. Louis asking that the next convention be held in that city was received. Officers for the ensuing year were elected as follows: President, John R. Copeland, Birmingham, Ala.; vice-presidents, William Conway of Philadelphia, M. E. Gregory of Corning, N. Y., Lemon Parker of St. Louis; secretary, T. A. Randall, Indianapolis; treasurer, John W. Sibley, Birmingham, Ala.

Technical Meetings.

The convention of the League of Georgia Municipalities will be held in Augusta, Ga., June 13, 14 and 15.

The twenty-second annual convention of the International Association of Fire Engineers will be held in Dallas, Tex., Oct. 9, 10, 11 and 12.

The tenth annual convention of the League of American Municipalities will be held in Chicago September 26, 27 and 28.

The annual meeting of the American Water-Works Association will be held at Boston, Mass., July 10, 11, 12, 13 and 14. A circular regarding railroad and hotel rates has been issued. J. M. Diven, secretary, Charleston, S. C.

The annual convention of the American Institute of Electrical Engineers will be held in Milwaukee, Wis., May 28 to June 1. Ralph W. Pope, secretary, New York city.

The annual meeting of the National Electric Light Association will be held June 5 at Atlantic City, N. J. W. C. L. Elgin, secretary, 136 Liberty street, New York city.

The annual convention of the American Society of Civil Engineers will be held June 26 at Thousand Islands, N. Y. Chas. Warren Hunt, secretary, 220 West Fifty-seventh street, New York city.

The third annual meeting of the American Mosquito Extermination Society was held in New York city April 11. A "Mosquito Brief," which had been drawn up by an advisory board of entomologists, regarding the mosquito and its suppression, was submitted to the convention and adopted. A paper read by Dr. Charles B. Davenport, of Cold Spring Harbor, N. Y., pointed out some of the deficiencies and delinquencies of rural boards of health. He held that those boards could not be expected to conduct a successful campaign against mosquitoes and flies, owing to their lack of sanitary knowledge and the fact that their executive health officer is generally a local practicing physician, whose income is largely dependent upon treatment of patients suffering from malaria and from the diseases transmitted by flies. He urged, therefore, that in all but the large cities health officers should be appointed by the state and that in every case they should be sanitary experts, but should not be engaged in private medical practice. The officers of the society are: President, Wm. J. Matheson; vice-president, Walter C. Kerr; treasurer, Frederick C. Beach; secretary, Henry Clay Weeks, Bayside, L. I., New York city; assistant secretary, Edward Hagaman Hall. All of the officers are of New York city.

At the regular meeting of the Brooklyn Engineers' Club April 12 a constitutional amendment increasing the annual dues of corporate and associate members to $10, with an initiation fee of $10, was amended by adding a clause raising the non-resident members' dues to $5. This amendment will be voted on at the next meeting.

The fourth congress of the International Association for Testing Materials will be held at Brussels, Belgium, September 3 to 8.

The next meeting of the Association of American Portland Cement Manufacturers will be held at Atlantic City June 11, 12 and 13.

The Cement Dealers' Association of Connecticut has elected the following officers: F. H. Johnson, New Britain, president; A. A. Jackson, Hartford, first vice-president; A. H. Chappell, New London, second vice-president; E. B. Bronson, Winsted, treasurer. W. L. Damon, New Britain; F. S. Bedwell, Windsor Locks; G. N. Dean, Stamford, directors.

The Engineers' Society of Western Pennsylvania is now located at 803 Fulton building, Pittsburg, Pa.

The annual convention of the American Society of Mechanical Engineers will be held at Chattanooga, Tenn., May 1 to 4.

U. S. Civil Service Examinations.

Examinations will be held at the usual places on May 9, 1906, for nautical expert in the hydrographic office of the Navy Department at Washington, D. C., at

$1,000 a year and, and for one at Cleveland, O., at $1,200 a year.

On May 23 and 24 examinations will be held for assistant in the Philippine service at $1,200 a year, with qualifications in bookkeeping or accounting.

On May 16, 17 and 18 examinations will be held for structural and mechanical draftsman in Engineer Department at Large at Wheeling, Va., at $1,320 a year, and two engineer draftsmen in the Reclamation Service at $1,500 to $2,000 a year.

On May 16 examinations will be held for engineer and miller at San Carlos Agency, Ariz., at $900 a year.

Examinations will be held May 3 and 4 for assistant electrical engineer, Signal Service at Large, in California, at $1,400 a year, and on May 2 for electrical assistant at $900 a year, six vacancies.

Results of April Elections of City Officials.

Municipal officers were elected and reelected during April as follows:

MICHIGAN:

Mayors:

Adrian—Frank S. Barnum.
Albion—D. M. McAuliffe.
Alpena—Dr. Edward E. McKnight.
Alma—Charles M. Delavan. Also Delos W. Adams, clerk, and Jas. A. Baker, treasurer.
Belding—W. C. Spicer.
Benton Harbor—Monroe Morrow.
Big Rapids—C. W Doe.
Coldwater—G. E. Kleindinst.
Crystal Falls—M. H. Moriarity.
Corunna—W. A. McMullen.
Clare—George E. Brenner.
Charlotte—C. W. Morrell.
Cadillac—E. L. Metheany.
Dowagiac—Dr. R. G. Herkimer.
Eaton Rapids—C. S. Horner.
Escanaba—M. Perron.
Flint—Geo. E. McKinley.
Gladstone—I. E. Shelly.
Greenville—Paul Van Diense.
Grand Haven—John F. Carl.
Grand Rapids—George E. Ellis.
Grand Ledge—L. W. Campbell.
Hudson—John D. Yealey.
Hastings—Dr. G. W. Lowry.
Holland—Jacob Van Putten.
Hillsdale—L. A. Goodrich.
Hancock—A. J. Scott.
Iron Mountain—Louis Stockly.
Ionia—Robert Baird.
Ishpeming—D. J. Sliney.
Ironwood—D. E. Sutherland.
Kalamazoo—Wm. Thompson.
Ludington—F. W. Graham.
Lansing—Hugh Lyons.
Marine City—S. C. McLouth.
Monroe—Dr. Geo. E. Heath.
Manistique—Norman Fox.
Marquette—Rush Culver.
Mason—Lawton T. Hemans.
Mt. Pleasant—H. A. Miller.
Mt. Clemens—Varnum J. Bowers.
Manistee—Dr. James A. King.
Muskegon—N. B. Lawson.
Menominee—A. Spies.
Marshall—B. L. Gardinier.
Negaunee—Joseph H. Winters.
Niles—M. Stoll.
Owosso—Stanley E. Parkhill.
Pontiac—Dr. H. C. Guillot.
St. Clair—Frank Schropferman.
South Haven—Charles E. Abell.
St. Joseph—James Forbes.
Stanton—Frank A. Miller.
St. Louis—John Burns.
St. Johns—John McKinley.
Standish—Alex. Forsyth.
Sturgis—C. A. Freeland.
Three Rivers—J. J. Foster.
Traverse City—A. V. Friedrich.
Yale—Thomas U. Wharton.
Ypsilanti—John Van Fossen.

ILLINOIS:

Arrowsmith—Village president, Chas. R. Stoutenborough, E. L. Bogle.
Chenoa—Aldermen, Joseph Miller, A. D. Jordan, John Schmitt.
Colfax—Trustees, John R. Williams, John Dischо, F. J. Harris; village clerk, Claire M. Green.
Cullom—Trustees, E. D. Brady, J. A. Heckelman, Chas. Keck; clerk, L. E. Gingry.
Cornell—Trustees, B. R. Johnson, Simon Jamison, W. J. Wellman; clerk, Henry Schneider.
Elkhart—Trustees, Joseph Keckler, Joseph Fitzgerald, Ralph Lambert.
Fairbury—Aldermen, Henry Webber, Everett Chambers, Dr. R. J. Rayburn.
Farmer City—Aldermen, J. W. Kenhall, C. B. Arbogast, W. R. Pryor.
Flanagan—Clerk, F. Sherry; trustees, W. H. Flanagan, Wm. Moulds, B. F. Kearfott, B. Huxtable.
Gridley—President, J. R. Sieberns; trustees, H. H. Albers, Wm. Lynch, Alexander Helbling, Henry Benedict, Chas. Hughes, John Egloff; clerk, C. J. Rowley.
Hudson—Clerk, —— Condon.
Heyworth—Village trustees, J. C. Wakefield, Alfred Ducker, A. V. Hagerman, A. D. A. Hull; city clerk, M. G. Plumley.
Hopedale—City clerk, J. P. Waldon; trustees, D. W. Britton, C. W. Hawk, G. O. F. Foward.
Kenney—Clerk, A. F. Watson; trustees, E. P. Hildreth, Dan Rung, Wm. Myors.
Maroa—Aldermen, A. J. Lutz, W. H. Mace; clerk, Vance McClure.
Manior—Clerk, R. W. Kinsey; trustees, P. A. Lower, Wm. Brennerman, J. O. Ling.
Mansfield—Trustees, E. E. Killion, S. S. Montgomery; village clerk, Thos. H. Hollihan.
Minonk—Stork Ingerski, A. W. Fulton, Arnold Brandt.
Metamora—City clerk, J. W. Frantz; aldermen, Joseph Getz, John Nauman, Joseph R. Wagner.
Paxton—Aldermen, D. D. Denman, P. A. Kemp, H. C. Hall, John H. Nelson.
Panola—President, L. G. Buss; clerk, Wm. Oberlander.
Pekin—Aldermen, Oscar F. Fogelmark, Geo. Taubert, Geo. B. Hornish, Crino B. Jansen, Jacob Graf, Ben H. Smith.
Roanoke—Trustees, T. E. Brown, J. E. Woltzon, Eli Gudeman; clerk, John O'Brien.
Stanford—Mayor, F. L. Garst; clerk, Clark Murphy; aldermen, J. H. Lamb, Wm. H. Springer, Geo. Haggard, J. Hamblin.
Saybrook—Clerk, J. J. Robinson; trus-

tees, Lincoln McCollom, Mason Moreland, C. D. Cunningham.
Strawn—Clerk, J. T. Toohy; trustees, Q. O. Read, W. H. Harlan, J. Kuntz.
Towanda—Village trustees, A. C. Harmon, C. W. Falkingham, A. M. Kerr.
Weston—Village president, Geo. E. Wild; trustees, Fred Wornesman, W. H. Loper, C. E. Graves, E. F. Law, G. W. Eckhart, E. B. Lennington; village clerk, Edgar Johnson.
Waynesville—Trustees, W. C. Zoll, M. Connell, C. M. Peal, R. A. Jeffries; clerk, J. E. Buck.

Personal Notes.

Hon. A. S. Murray has been elected mayor, at Jonesboro, Tenn.

J. A. Omberg, Jr., has been re-elected city engineer, at Memphis, Tenn.

Philip Prioleau has been reappointed city engineer, at Jacksonville, Fla.

George Miller has been appointed assistant city engineer, at Des Moines, Ia.

Louis E. Gray has been appointed superintendent of water works at Lockport, N. Y.

Albert Root, assistant city engineer of Newport, Ky., has been elected county surveyor.

S. D. Higley has been elected secretary of the Thomson Meter Company, of Brooklyn, N. Y.

John Winters has been elected city engineer, succeeding William Steyh, at Burlington, Ia.

M. A. Sinclair has been appointed superintendent of the water department, at Bangor, Me.

Jerry O'Shaughnessy has been reappointed superintendent of water works, at Columbus, O.

Hon. Sherburn M. Becker has been elected mayor, at Milwaukee, Wis., to succeed Hon. David Rose.

W. N. Case has been re-elected secretary and manager of the water and light department, at Duluth, Minn.

S. H. Kent has been appointed city clerk, at Hamilton, Ont., to succeed Thomas Beasley, who resigned on account of illness.

Samuel H. Lea, Mem. Am. Soc. C. E., Sturgis, S. D., has been appointed State Engineer of South Dakota, with headquarters at Pierre, S. D.

Isham Randolph, chief engineer of the Chicago Sanitary District, has been engaged to examine the proposed plans for preventing floods at Des Moines, Ia.

M. M. Mancse has resigned as assistant engineer in the bureau of filtration, at Pittsburg, and will take up a general practice in civil and sanitary engineering in that city.

B. B. Lathbury, M. Am. Soc. C. E., formerly senior member of Lathbury & Spackman, has opened offices as consulting engineer in the Land Title Building, Philadelphia.

Mr. L. L. Griffith, formerly superintendent of the Bonneville Portland Cement Company, has been appointed assistant superintendent of the Vulcanite Portland Cement Company.

I. M. de Varona, who heretofore has been acting as chief engineer in several boroughs, has been appointed chief engineer of the bureau of water supply, gas and electricity of New York City.

Major J. P. Clavbrook has been appointed city engineer, at Louisville, Ky., to succeed J. B. F. Breed, who has been appointed chief engineer of the board of sewer commissioners. Major Claybrook has been assistant city engineer for four years.

George L. Campen has resigned as city engineer, at Lincoln, Neb., to become water commissioner of the Panama Canal Zone. William Grant, formerly of the engineering corps of the Chicago, Burlington & Quincy Railroad, has succeeded him as city engineer.

Henry William Parkhurst, past president of the Western Society of Engineers, and a member of the American Society of Civil Enginers, died in Chicago, April 7, as a result of an accident that he met with February 20, in crossing a railroad track, in which he received a fracture of the skull.

Dr. Edward Burr Van Vleck, who has just been appointed to the chair of mathematics at the University of Wisconsin, left vacant by the resignation of Prof. C. A. Van Velzer, has been professor of mathematics at Wesleyan University since 1898, when he succeeded his father, J. H. Van Vleck, for many years professor of mathematics at Wesleyan University and now professor emeritus. Prof. Van Vleck, after being graduated from Wesleyan in 1884, continued his studies at Johns Hopkins, where he held a graduate fellowship in mathematics. For three years he pursued advanced work at the University of Gottingen, Germany, for which he received the degree of doctor of philosophy in 1893. Upon returning to this country, Dr. Van Vleck became instructor in mathematics in the University of Wisconsin, a position in which he remained until 1895, when he returned to his alma mater as professor of mathematics. Prof. Van Vleck has done much research work in mathematics, and is recognized as one of the best mathematicians in this country. He has contributed a number of important papers on various mathematical subjects to the *American Journal of Mathematics*, the *Transactions of the American Mathematical Society*, and the *American Annals of Mathematics*.

Prof. W. D. Pence, who has just been appointed to a professorship of civil engineering in the college of engineering of the University of Wisconsin, has held the chair of civil engineering in Purdue University for the last seven years. Prof. Pence, after considerable practical work in civil, drainage, and railroad engineering, entered the school of civil engineering of the University of Illinois, from which he was graduated in 1886. For six years following his graduation he was in the service of the Santa Fe railway system as assistant engineer, roadmaster, assistant engineer of maintenance of way, and resident engineer. In 1892 he resigned his position with the Santa Fe to become a member of the faculty of the school of engineering of the University of Illinois, where he remained until called to the chair of civil engineering at Purdue in 1899. While teaching at Purdue and Illinois, he was also engaged in practical engineering work, and was a member of the commission appointed to study the drainage of the Kankakee marshes. Prof. Pence is the author of a book on "Stand-Pipe Accidents and Failures," the joint author of a "Surveying Manual," and editor of the publications of the American Railway Engineering and Maintenance of Way Association.

MACHINERY AND TRADE

The Thomas System of Building With Concrete Blocks.

A system of building with concrete building blocks of a special form has been devised by A. O. Thomas, of Kearney, Neb., which has many attractive features.

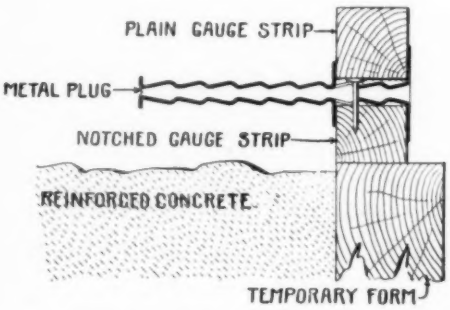
In horizontal section the regular block has the general form of the Z-bar which has been found of so much value in steel building construction. For a single block wall one of the arms of the Z is set in the outer face of the wall and the other in the inner surface of the wall. A series of blocks laid in order form a course. The next course breaks joint with the first course and bonds the wall through. Special forms are provided for corners, jambs, etc. For a double-block wall, two rows of blocks are set, one with finished face on the outside of one of the arms of the Z set in the face of the wall, and the other with one of the Z arms in the inner surface of the wall. The other arms of the Z in the two rows of blocks mesh together so as to form a wall, a vertical cross section of which at certain points will strike four arms of blocks and in others will strike an arm of one block and the connecting web of the other block. The courses being laid to break joint, the wall is thoroughly bonded and at the same time thoroughly ventilated and having no vertical joints extending entirely through the wall, and in the double wall having no joints extending through the wall. Half the blocks used in a double wall are entirely hidden and less than half of the outer set of blocks shows in the face of the wall, so that the amount of facing is reduced to a minimum.

The manufacture of the blocks is also very easy. For making the inner set of blocks in the double wall a gang mold is provided in which 32 blocks can be made at once. The blocks are made with concrete as wet as it can be well handled. Two smaller machines are used for making the face blocks, on which any desired finish can be put. These blocks are made moisture-proof without the use of chemicals. Mr. Thomas has the good sense and the courage to say: "As the common rock-faced stone appears cheap, and as it gathers dirt and moisture, we have not cared to attach it to our high-grade product." However, molds for producing rock-faced designs can be furnished those desiring them, but these blocks are not waterproof.

Several designs of wall and of blocks are shown in the circular which Mr. A. O. Thomas will furnish on application to him at Kearney, Neb.

Rutty Metal Wall Plugs in Concrete Construction.

Anyone who has worked on concrete-block construction knows that it is practically impossible to open up the joints after the cement has once hardened. It



RUTTY METAL WALL PLUG IN REINFORCED CONCRETE.

is therefore a most difficult matter to secure the interior finish unless proper provision has been made for the same while the construction was going up. Various ways have been tried for the purpose of securing a nailing base, mostly in the line of some form of wood brick built into the wall during construction. These methods have not proven satisfactory, however. The introduction of the Rutty wall plug overcomes this most vexatious feature in concrete construction.

The Rutty plug is made of heavy sheet steel, so formed that an opening is made for a ten-penny or even larger nail.

The plug is of such a thickness that it is instantly placed in the mortar joints as the walls go up, and when the cement hardens the plug is immovable. The flexibility and form of the plug, however, readily admits of a nail being driven into

it without in any way disturbing the construction.

This form of plug is adaptable to all situations where wood is used for lathing or interior finish. Where metal lath of any variety is to be employed our new non-furring plug will be found to be a marvel of efficiency and economy. This style of plug does entirely away with the use of metallic furring and forms a perfect base on which to stretch the metal lath, at the same time forming a continuous air space of three-fourths of an inch.

The non-furring plug is also perfect as applied to reinforced concrete construction, being readily placed in the wooden forms as required. After the forms are removed the plug will project three-fourths of an inch in inside face of wall, thus obviating the use of metallic furring. Wood brick, nailing strips, etc., should never be allowed in this form of construction, for most obvious reasons.

J. B. Prescott & Son, Webster, Mass., are the sole manufacturers and patentees of this system and will be pleased to submit information, samples and prices. It is already in use very generally throughout the United States and Canada, and will be found to be not only highly efficient, but most economical.

Standard Hose and Hydrant Couplings.

The National Fire Protection Association has adopted a set of standard threads for fire hose and hydrant couplings, which has been adopted also by three waterworks associations, including the American; by three firemens' associations, including the National and the International, and by two fire insurance organizations, both national. A circular has been printed for distribution, which gives the details of tne adopted designs for 2½-inch, 3-inch, 3½-inch and 4½-inch sizes. It is very important that the standard, which has been approved by so many authoritative organizations, should be adopted by all. F. M. Griswold, 56 Cedar street, New York city, is the chairman of the special committee on the subject, and will doubtless supply copies of the circular.

The Studebaker Ideal Dump Wagon.

The accompanying cut shows the Studebaker patent "Ideal" dump wagon as built specially for municipalities. With the side wings shown, which are hinged so that they can be dropped for convenience in loading, any volume of light, bulky materials from three to six cubic yards can be provided for. The wagon dumps with trap doors on the bottom. The cut shows these trap doors open and also one side dropped to reduce the lift for loading from the street or ground.

STUDEBAKER IDEAL DUMP WAGON.

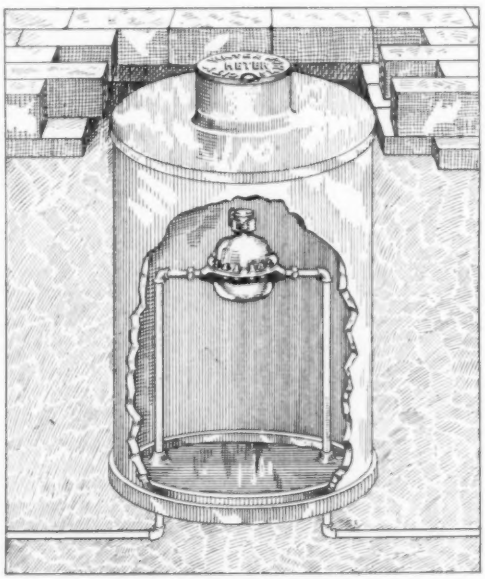
A Cement Burial Vault.

The Meadville Artificial Stone Co., Meadville, Pa., makes a burial vault which is said to cost but a trifle more than a brick vault and which has the advantages of being air and waterproof when the lid is cemented on, and of being absolutely permanent. Various standard dimensions are given in the circular illustrating the construction. The addition of this special form of concrete construction

to the outfit of concrete block, cement sidewalk and other concrete workers should prove profitable. The company will give full information on request.

Boxes for Water Meters.

The location of a water meter outside of a building was long a difficult matter, the danger of freezing and the difficulty of reading being two troubles one of which was nearly always present. Mr. H. W. Clark has devised a scientific box in which to set meters which protects the meter from freezing and does not at the same time make it impossible to read it.



CLARK'S METER BOX.

The accompanying drawing shows how carefully the details have been worked out. The vertical cylindrical part may be of 20-inch vitrified tile or spiral riveted iron, or other material if required.

The cover is of cast iron of the form shown, the bottom fitting over the top of the cylindrical top with an inner ring fitting inside the cylinder. The throat extending to the ground surface may be of any desired length. There are two standard lengths, one long enough to extend up through a heavy block pavement and the other suitable for a thin pavement, a gravel or macadam roadway.

The small cover or lid for the top of the throat is but 8 inches in diameter and is of heavy cast iron, fitting on the cast-iron top ring. Everything is covered but this lid, which appears flush with the surface of the pavement or ground. The lid is securely locked by a specially constructed locking device of brass, shown in the smaller cut. The key which accompanies it shows the peculiar shape of the bolt head, such that ordinary water keys will not fit, and so it cannot be readily opened by unauthorized persons. The bolt engages suitable lugs on cover and lid and one-third of a turn of the key locks the lid securely. The meter is easily read through the 8-inch throat, and the ease of unlocking and re-locking the lid makes the loss of time of the meter reader in getting to and from the meter a minimum.

If a water-tight box is wanted, the vitrified cylinder forming the body of the box may be set in the cast-iron base shown by the larger cut. The rim of the box sets in the outside groove of the base. The water pipe passes up and down through two holes in this base as is shown clearly in the cut. A little Portland cement used in setting the box and about the pipe in the holes, with a little plastering in recesses makes the joints water-tight.

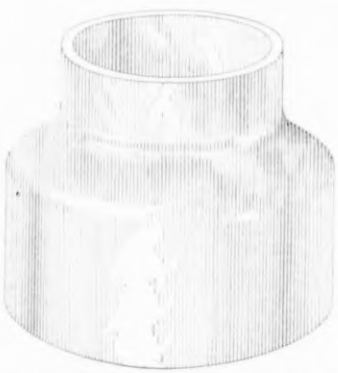
The water pipes are brought up into the box and the meter is set on the horizontal between the two vertical pipes as shown in the drawing. The height to

which it is raised depends upon the climate, but it is claimed that it can always be sufficient to make the reading of the meter convenient, even in the coldest cli-

LOCK AND KEY FOR CLARK'S METER BOX.

mates. Practical tests have shown the meter in good working order when the temperature of the outside air was 10 degrees below zero and the ground was frozen 32 inches deep, the meter being 18 inches below the surface.

For the largest size meters a reducing box, shown in the last cut, is used, the



EXTENSION FOR CLARK'S METER BOX WITH LARGE METERS.

top of this box being of the same size as the regular box so that the same cover and lid can be used. The meter can be taken out and replaced through the 20-inch top of the box when necessary without necessity of excavating except the four inches necessary to reach the cover.

Special designs are furnished when needed.

The advantages of meter boxes in the pavements or lawns are numerous. Among them are ready access for a reading without trying to enter a house or removal of materials liable to be piled on the meter; saving of annoyance to consumer; detection of underground leaks in the service; absolute protection from frost, protection from fire and other damage; protection from tampering by unauthorized persons.

Mr. H. W. Clark will send a full descriptive circular and give any desired information on application at 1518 Broadway, Mattoon, Ill.

A New Firm in the Cement-Block Machine Manufacture.

The Corn Belt Manufacturing Company of Waterloo, Iowa, has succeeded the Frost Concrete Stone Company in the control of the Frost cement-block machine. The company comes into possession of a large stock of the new improved 1906 models of the machine and offers a limited number of them at a very interesting price. With the attachments the machine is forty machines in one and makes over one hundred different sizes, shapes and styles of blocks. A postal card will bring more detailed information.

White Portland Cement.

For the last year or so the columns of the engineering journals have been more or less taken up with articles regarding white Portland cement, the possibility of making the material, and the uses to which it could be placed if manufactured. Mr. Melville M. Smith, formerly of the Sandusky Portland Cement Company, is one of the cement chemists who have been experimenting in white Portland cement, and he succeeded in November, 1905, in working out a process whereby the cement could be manufactured in a practical way. He was successful in interesting capital, a company was organized, known as the Art Portland Cement Company, and incorporated under the laws of the State of Indiana.

The factory is at present being erected and is located at Kimmell, Ind. The annual output will be 180,000 barrels. The cement will be a marl cement, manufactured by the wet process. The rotary kilns will be 7 feet in diameter by 100 feet long. Electrical transmission will be used throughout and the plant will be modern in every respect. The cement will

be placed on the market by August 1, 1906. The offices of the company are at present at Syracuse, Ind., and any information desired relative to their product will be promptly given by the managtment upon request.

Concrete Blocks are Fire-Proof.

The following letter from Mr. O. H. Sweeney explains itself:

"I inclose print of the paint shop of the Iowa Dairy Separator Co.'s plant, Waterloo, Ia., which was burned out a few days ago. This fire was one of the hottest imaginable on account of the inflammable material contained therein. The building is the smallest of five or six concrete buildings used by the Iowa Dairy Separator Co., whose plant is situated nearly half a mile from the fire station. The fire occurred during the night, and the entire interior was a mass of flames before the fire was discovered; hence the walls had become very hot on the inside before any water was thrown on them, which was freely done. The fire wall through the center protected the far end. At 7 o'clock on the morning after the fire, work was commenced to clear the "ruins," and before night a new floor had been placed and the painters were at work before the roof or windows were replaced. The photograph was taken the morning of the second day, which shows how quickly the repairing was done. Had the outside walls been of wood, they would have been entirely consumed on account of the fierceness of the fire and the good start it had before discovery. If they had been built from brick or stone, throwing water on the hot walls would have rendered them unfit for use without rebuilding, whereas, having been built from blocks, the shop was rebuilt the second day.

The blocks were made on the Dunham machine of the Waterloo Concrete Brick and Block Machine Co., Waterloo, Ia., who will give full particulars if requested.

EFFECT OF FIRE ON CONCRETE BLOCK BUILDING.
Photograph taken on second day after fire, when repairs to wood work and roof had been nearly completed.

Hercules Cement Stone.

The Century Cement Machine Company, 181-3 West Main street, Rochester, N. Y., has issued a catalogue of its 1906 model of the Hercules cement stone machine, which shows in detail what can be done in making artistic forms of cement blocks and using them in good buildings. The title page of the catalogue claims that "houses, factories, churches, storage warehouses, silos, cellar walls, porches, piers, automobile houses, garages, etc., can be built with stone made on it at a cost far below either brick or cut stone."

The ease with which a richer facing can be put on a block is shown, whether of the natural color or with any color desired, with consequent saving in cost of block and improvement in appearance and quality of surface.

Some very excellent instructions are

given for making blocks practically waterproof, which have been proven by practical experience of the manufacturers and many others.

The variety of plain and ornamental forms of block made on this machine is great and many of the designs and photographs of blocks and structures built of them are shown in the catalogue. The standard machine will make blocks six feet long or less, and when blocks less than about thirty-two inches are to be made two can be made at once, thus doubling the capacity of the machine for most of the standard sizes of blocks.

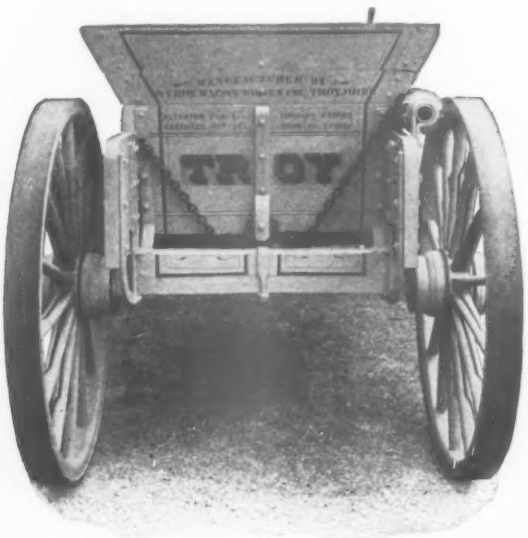
Chimneys, gate posts, caps, and porch pillars are among the special forms shown. There are some very artistic designs for keystone lintels, door casings, copings, friezes, columns, capitals, bases, pilasters and balustrades shown in the catalogue.

The company also supplies an outfit for its methods of laying combined curb and gutter and all kinds of tools for finishing cement work. The process of making a machine in its factory is quite well demonstrated. Upon special order it can supply the Hercules machine of any larger size that may be desired.

Among the buildings in which the Hercules blocks have been used pictures are shown of a church at Prairie du Sac, Wis., and a three-story and basement apartment house at Greenfield, Mass., built entirely of Hercules blocks and the Home for the Aged at Rochester, N. Y., in which they are used for trimming.

Bottom Dump Wagons for Contractors and Municipalities.

A new catalogue has been issued by the Troy Wagon Works Co., Troy, O., which shows the various styles of their new bottom-dump wagons. The trouble with many bottom-dump wagons is found in their failure to close tightly, so that fine substances, such as sand, will leak out as the wagon moves along the road. The Troy wagon is so constructed that this difficulty is said to have been removed. The doors are of sheet steel, heavily reinforced on the under side for the entire length, and on each end of each door is riveted a steel angle, which not only stiffens the door, but seals the ends of the wagon box so that the fine material cannot run out at the ends of the doors. One of the doors is raised up against the bottom of the wagon bed before the other begins to rise, so that there is a positive lap of the latter door on the former. This lap and that of the angles at the ends is two inches, which proves ample to make the wagon sand tight.



REAR VIEW OF TROY DUMPING WAGON.

The bottom doors are raised and lowered by turning a steel shaft running along one side of the wagon. Near each end of the shaft is a spiral, on which the chains handling the doors are wound. The doors swing clear of the bottom of the wagon and the regular bed is rectangular, so that any load in it is bound to drop when the doors are opened. There are no chains or other apparatus inside

the wagon. The end of the steel shaft and one of the chains for lifting the bottom doors are shown in the accompanying photograph of the rear end of the wagon.

The flaring sides shown in the photograph are an addition to the wagon to fit it for hauling light materials, such as street refuse, snow, garbage, etc., thus fitting it specially for many purposes of municipalities.

Most of the Troy Wagon Works Co.'s dump wagons will turn in their own length. Besides the forms mentioned, the company make special designs for crushed stone, ashes, sand and gravel, etc., all with the bottom dump. They will send full information on application to their office in Troy, O.

The Miles Concrete-Block Machine.

The Miles concrete-block machine, made by the P. B. Miles Manufacturing Com- Jackson, Mich., is one of the most successful machines on the market if number of sales is a criterion. It operates as a face-down machine, the facing of finer and richer mixture being put in first and followed by a coarser, cheaper mixture, filling the machine about one-third full, this backing being much better than the facing. This is then tamped thoroughly and leveled and the core is then put in position. The filling of the mold is then completed, the block is tamped and struck off even with the tamp handle, leaving this the back side of the block rough to receive plaster. The machine is then tilted on its side by its two handles, which sets the block on a wooden pallet forming one side of the mold box. The machine is opened up, withdrawing the face plates and leaving the block free to draw out. The core is then removed and the block is carried away to cure.

The machine is readily adjusted for any desired size or form of block, and when adjusted needs no further attention until a change in form is desired.

Lengths of blocks vary from 4 to 24 inches, widths from 4 to 12 inches and the height is 8 inches, with extra plates for 6-inch blocks if desired. There are various designs for face plates. Angle plates allow the other changes in form and gable blocks, circle, octagon and water-table blocks can be made. Nine interchangeable cores are furnished to give any desired thickness of block walls. The cores are held from movement in the mold by one lug.

The block surfaces are practically waterproof. Circulars will be sent on application.

Baltimore's City Engineer on Bitulithic.

In answer to a question Mr. B. T. Fendall, the city engineer of Baltimore, Md., wrote the following letter to John Hubert, chairman of the committee on highways of the Baltimore City Council, under date of March 30, 1906:

Answering the question propounded to me regarding the securing of competition as between bituminous macadam and bitulithic so as to secure a paving equally as good as bitulithic, I beg to advise that I do not know how to prepare such specifications.

Bitulithic is in a class by itself. The methods and plans for laying the pavement are patented. These methods and plans, so far as I can judge, give the best possible results that can be gotten in the shape of a pavement where the ingredients of the same are broken stone and some form of bitumen.

If I drew specifications for the best form of pavement of this character they will be the specifications under which the Warren Brothers Company lay their pavement. Their processes are patented, and I therefore assume that any one attempting to lay pavements in accord with their formulæ would be infringing upon their patents.

To provide a pavement such as shall be equal in quality to bitulithic, and of the same class as bitulithic, so far as I can judge, it must be bitulithic in fact, if not in name.

As to the second question my answer to the first question, I think, entirely answers the second question.

It is a little doubtful as to what is meant by the words "equal to the patented bitulithic pavement and in the same class." Sheet asphalt, asphalt blocks, first-class vitrified brick and bitulithic are all considered to be in about the same class when the prices are considered.

The bitulithic pavement has certain good qualities not possessed by the other four pavements, to-wit: It is not slippery, it is less noisy and, so far as I am able to judge from observation and reports covering the observations of other engineers, it is more durable.

Gardner Engineering Company.

The present tendency is toward combinations of men of various qualifications in companies which can make use of such men to better advantage than they can work alone, each supplementing all the others in every large enterprise in which the company engages. The Gardner Engineering Company, 136 Liberty street, New York city, is one of the more recent of these combinations intending to work mainly in manufacturing and contracting fields. Its charter gives it the right to carry on a general contracting and engineering business in all of its branches, enumerating many of them; to manufacture and handle machinery of all kinds, more particularly mentioning those kinds used by contractors and mechanical en-

gineers; to handle and manufacture structural materials, especially metals, and to hold and dispose of mills, plants and business organizations.

The present board of directors includes President John G. Lepper, M. Am. Soc. M. E., a consulting mechanical engineer; Vice-president Harsell, a designing and constructing mechanical engineer; Secretary and Treasurer Woodford, experienced in sales organizations and advertising; Director Jones, a mechanical engineer of long experience in export trade, and Director Woodford, an expert public accountant. It thus contains within itself a representation of most of the qualifications necessary in an organization of this kind.

Full information of the company and its work will be given by Secretary B. C. Woodford, 136 Liberty street, New York.

Trade Publications.

H. E. Goodwin & Co., Indianapolis, Ind., issue a catalogue of "perfectly ventilated blocks and the machines that mold them," a prominent feature in which is the exposition of his system of basement ventilating blocks, wall ventilation and joist blocks.

The Harbison-Walker Refractories Co., Pittsburg, Pa., send "A Little Talk on Brick for Boiler Settings," illustrated.

J. H. Sullivan, Grand Rapids, Mich., describes in a booklet his pressed steel plank holder for building up forms for concrete walls.

The "specification book" of the Clinton fireproofing system, issued by the Clinton Wire Cloth Co., Clinton, Mass., gives dimensions and distributed live loads for the various systems of design of floors and roofs, specifications and for wire cloth for various kinds of concrete, and full drawings and specifications for design and construction of floor arches according to ten or twelve types of several systems, and drawings for two or three types of roof. The booklet is very convenient for designers in selecting the best and most economical types for the conditions of their work.

The booklet of the Expanded Metal and Corrugated Bar Co., of St. Louis, Mo., has expanded into a volume of 232 pages, which is a compendium of the theory and practice of the construction of reinforced concrete structures using the Johnson corrugated bar, with or without expanded metal. It will be sent on application.

The Power and Mining Machinery Co., Cudahy, Wis., sends catalogue No. 4 of machinery for rock-crushing plants, giving also some designs for plants and pictures of existing plants.

No. 34 of "The Doings of Expanded Metal" describes the construction of coal bunkers, power house, hotel and warehouse, and illustrates the fireproof qualities of a reinforced concrete elevator shaft.

The Hydrex Felt and Engineering Co., 120 Liberty street, New York, sends a sample of Hydrex waterproof felt, with a circular describing its use pasted on the back..

Trade Notes.

ASPHALT.

Indianapolis, Ind.—Hetherington & Berner, of this city, have sold an asphalt plant to the city of Hamilton, Ont., Can.

Toronto, Ont.—Special. This city voted $20,000 for the purchase of a municipal asphalt plant.

Comanche, I. T.—A large bed of asphaltum has been discovered here and will be developed at once.

BRICK.

Crandon, Wis.—The Alden Clay Products Company has been incorporated by L. T. Crabtree, M. D. Keith and A. L. Crabtree. A plant will be installed this season.

CEMENT.

Roswell, N. M.—A new cement plant is to be build at Acme, 18 miles up the P. V. & N. E. Railroad from here.

Fenton, Mich.—The Logan Cement Company, which closed down about a year ago, is preparing to begin operations again, according to local press reports.

Pittsburg, Pa.—The Federal Portland Cement Company has been organized by capitalists in this city, with $500,000 capital, and a plant of 1,200 barrels daily capacity will be built on Decker's Creek, about 10 miles from Morgantown, W. Va., where the company has purchased thirty acres of land running along the creek. A large steel building 600 feet long and 150 feet wide will be erected at once.

Boston, Mass.—The Hudson Portland Cement Company has been incorporated to deal in Portland cement, with officers as follows: President, Otis Wold Richardson, 9 Bay State Road, Boston; treasurer, Addison R. Pike, Winchester, Mass.; clerk, Howland Twombley, Newton, Mass.

South Pittsburg, Tenn.—L. Hunt, representing Kansas City capitalists, purchased 85 acres of land from A. C. Cook, of this city, and a plant will be erected for the manufacture of cement.

Annville, Pa.—New York capitalists are negotiating with land owners in the limestone district west of here, with a view to establishing a cement plant.

Coldwater, Mich.—At the annual meeting of the Wolverine Portland Cement Company, held here March 27, a board of directors was elected as follows: L. M. Wing, F. M. Rudd, H. Bastianelli, James Helme, Dwight C. Rexford, Chas. Briggs and C. C. Jones. The directors reorganized by electing officers for the ensuing year as follows: President and general manager, L M. Wing; vice-president, F. M. Rudd; secretary and treasurer, E. R. Root; general superintendent, J. C. Smallshaw; chief chemist, F. I. Post. The company's showing for the last year was ex-

cellent, the sales for the year amounting to 623,926 barrels.

CONCRETE.

New concrete companies incorporated:

Atlantic and Gulf Portland Cement Co., 127 Market st., Camden, N. J., contracting and construction; capital, $10,000; in corporators, W. B. Walcott, Camden, Wm. E. Stokes and Jas. D. Evans, 119 S. 4th st., Philadelphia, Pa.

New Jersey Cement Construction Co., Newark, N. J.; capital, $5,000; O. Jaehing, G. G. Cooke, J. T. MacEvoy, Jr., Newark, incorporators.

DeWitt Cement Construction Co., Peoria, Ill., $2,000 capital; F. N. Hester, E. L. DeWitt, W. H. Bordeaux, incorporators.

American Concrete Machinery Co., Columbus, O.; John W. McPherson, Roy V. Cunningham, R. C. Kyle, W. L. Dugan, Rose S. Scott, incorporators; $100,000 capital.

Durable Cement Butt Co., Battle Creek, Mich., reorganized with $2,000,000 capital by C. D. Cramp, of Philadelphia, Pa.

Schutte Cement Construction Co., Sheboygan, Wis., increased capital to $10,000; H. C. Schuette, pres.; H. E. Murphy, sec.

Cleveland Concrete Construction Co., of Bradley co., Tenn., capital $10,000.

Miracle Cement Block and Sidewalk Co., Ltd., Moscow, Ida., capital $10,000.

John E. Layne Co., Minneapolis, Minn., capital $25,000; John E. Layne, T. T. Widdowson, Lois A. Layne, incorporators.

Casper Spies, Norwood, Minn., has invented a reinforced cement fence post.

J. M. Dunning, of Dunning Wire and Fence Post Works, Cedar Rapids, Ia., now has control of Pyramid Post and Pole Co., with patents on expansible steel mold for making posts and poles.

Wm. L. Phillips, Broken Bow, Neb., has patents on concrete block forms.

CONCRETE BLOCKS.

The following are recent additions to the business of making concrete blocks, artificial stone and cement brick:

L. Cofield, Annandale, Minn.

Gerber & Schmalz, Lester Prairie, Minn.

Parish & Homme, Roseau, Minn.

Smith & Monroe, Sedro-Woolley, Wash.

Geo. Hallett, Glenwood, Minn.

Permanent Construction Co., Pierre, S. D.

J. M. Fielder and J. W. Hensley, Lake City, Fla.

Cement Products Co., Wilmington, Del., enlarging.

Cement Products Co., Erie, Pa.

T. Willet, Swanville, Minn.

Mr. Brackett, Spokane, Wash.

Jas. Davis, Giester, Minn.

Frank Mitzel, Great Bend, N. D.

W. D. Crone, Imogene, Ia.

W. A. Lander, Connell, Wash., and Moscow, Ida.

Harry Siem and Fred Thompson, Miles City, Mont.

Fairmont Cement Stone Mfg. Co., Fairmont, Minn.

Electrical Cement Post Co., Lake City, Ia.

Greenfield Concrete Co., Greenfield, Tenn.

Robert C. Brown and Frank Fabel, Stroudsburg, Pa.

Modern Stone and Supply Co., Portland, Ore., Miles machine.

J. D. May, Pendleton, Ore., Miles machine.

Childers Bros., Medford, Ore., complete Miles outfit.

J. A. Fastabend, Astoria, Ore., Miles machine.

Early Concrete Stone Co., Early, Ia.; C. C. Wetzstein, G. H. Wetzstein and F. H. Bloss, incorporators, $15,000 capital.

Waukesha Concrete Block and Material Co., Waukesha, Wis., capital $15,000; Wm. H. Hardy, Jr., W. P. Sawyer, J. A. Rodgers, F. J. Pierce, incorporators.

Schall Interlocking Concrete Block Co., Chicago, Ill., capital $10,000; incorporators, Joseph Schall, Herman Verbeck, Rudolph W. Lotz.

Ohio Sandstone Co., Chicago, Ill., capital $10,000; incorporators, Louis E. Hart, John R. Montgomery, Catherine Davitt.

Consolidated Cement and Stone Co., Dallas, Tex., capital $10,000.

Central Concrete and Construction Co., Louisville, Ky., capital $25,000.

The Louis O'Connell Co., Tiffin, O.

C. F. Brown, C. M. Denham and Clayton Porter, Punta Gorda, Fla.

Webb N. Graham, Florence, Ala.

The Header-Bond Concrete Co., Baltimore, Md., capital $60,000. Jos. E. Wickes pres.; F. W. Feldner, sec. and treas.; ex-Gov. E. E. Jackson, W. H. Gibson, G. W. Gail, Jr, directors; E. Russell Cooper, manager.

Capt. I. A. Hill and Joseph Solomon, Harriman, Tenn.

Southern Artificial Stone Co., Memphis, Tenn., capital $5,000; incorporators, W. B. Hoffman, T. C. Ashcroft, G. M. McCormick, Henry Carr, Guy Moyston.

St. Joseph Concrete Stone Co., St. Joseph, Mo.; J. M. Hunter, gen. mgr.

Kline Co., Indianapolis, Ind., capital stock $15,000; directors, H. Z. Kline, A. F. VanOstran, John W. Parkalow.

W. F. Roark and A. F. Wollschlaeger, Waseca, Minn.

T. E. Sleight, Drake, N. D.

Rugby Press Stone Co., Rugby, N. D.; Fred Raas and W. J. Anderson.

E. Wence and Jas. McKinley, Humeston, Ia.

A. A. Cavanaugh, supt., Glencoe, Minn.

Iowa Enamel Stone Co., Des Moines, Ia., capital $40,000; Frank Stehm, Oren Ruffcorn, M. L. Dudley, E. R. Smith, C. C. Pugh and Josiah Needham, incorporators.

Kramer & Lake, LeMars, Ia.

August Kanon, Comfray, Minn.

Builders' Concrete and Cast Stone Co., Superior, Wis., using Perfection machine.

A. Woodward, Winside, Neb.

Cooperstown Tile Works, Cooperstown, N. D.

Lincoln, Neb.—Special. The Century Cement Machine Company advises us that it is building an extensive plant here for the Lincoln Stone and Supply Company, at a cost of $25,000, for manufacturing cement stone. The plant is to be in operation May 1. Hercules machines, Chicago cube mixers, and U. S. cement shingles will be used. The officers of the company are: President, J. L. Kennard; vice-president, C. R. Lehrack; secretary and treasurer, A. G. Hebb.

Warren, O.—The Trumbull Brick Company has been incorporated to deal in clay, stone, iron ore, and other minerals, by Charles W. Crook, C. S. Crook, M. E. Phillips, C. E. Lotze and M. W. Donaldson.

Louisville, Ky.—The Central Concrete Construction Company has been incorporated by Robert C. Morris, Arthur Kaye, Taylor B. Brown, P. S. Hudson and C. J. Meddis.

Hannaford, N. D.—Edland Brothers are installing machinery for a sidewalk-tile plant.

Washington, Ia.—McKeone & Shields have dissolved partnership in the concrete block business, Mr. McKeone succeeding.

Anoka, Minn.—Joseph Smith, of St. James, Minn., has purchased the Wm. Vrooman interests in Vrooman Brothers' cement and paving business here.

Rice Lake, Wis.—George B. Raynor has purchased the business of the Rice Lake Stone Company, and will enlarge the works and add cement brick manufacture to them.

Graettinger, Ia.—The Graettinger Tile and Cement Block Company has been formed here to manufacture cement blocks, brick and tile. A cement building, 48x80 feet will be erected.

Dodgeville, Wis.—The Commercial Club of this city contemplates securing a cement block plant.

DeWitt, Ia.—Smith & Lambertson have dissolved partnership in the cement walk business, W. E. Lambertson succeeding.

Kenmare, N. D.—G. V. Clark and N. B. Hawkins have purchased the plant of H. E. Peck, called the Kenmare Cement Works.

Minneapolis, Minn.—The Winner Block Machine Company has been incorporated by John Miller, Lewis Cobey and Orin L. Gillespie.

Racine, Wis.—The Racine Cement Construction and Casting Company has been incorporated by E. C. R. Skow, John Herrman and Joseph Reich. The Racine Hollow Concrete Wall Company has been incorporated by F. Arthur Morey, Henry A. Hoernel and Fulton Thompson.

Dows, Ia.—A. A. Bangs will enlarge his cement products works this season by adding a gasoline engine and a concrete mixer and probably a fence post machine.

Cedar Rapids, Ia.—The Voss Lumber Company has resumed the manufacture of cement blocks.

Atlantic City, N. J.—The Reinforced Concrete Construction Company has been incorporated by Edward L. Baeder, Francis B. Coll and William Lamb, to manufacture concrete blocks, erect concrete structures, and deal in building materials.

Pittsburg, Pa.—The Standard Building Construction Company has purchased a 10-acre site on Noville Island on which it will build a $40,000 plant for the manufacture of concrete from furnace slag, river gravel, crushed marble, and cement.

Davenport, Okla.—The Davenport Concrete Block Company has been incorporated by A. J. Langer, T. S. Watts and C. C. Randal.

Milford, Va.—A company is being organized by W. W. Gresham for the establishment of a plant to manufacture cement building blocks, cement bricks, fence posts, etc.

Cumberland, Md.—The Miracle Pressed Stone Company has been incorporated to manufacture hollow concrete building blocks, concrete brick, etc., by Silas W. Wise, John L. McLaughlin, P. Gibson Cowden, Jr., James E. Perrin and Patrick Hopkins.

Waterloo, Ia.—C. L. Baldwin purchased, April 12, the interests of Del F. Scholes in the Baldwin-Scholes Manufacturing Company, manufacturers of the Polygon concrete mixers, and will continue the business.

Columbus, Miss.—The Kelly-Pope Concrete Company has been organized to manufacture cement brick, cement stone, concrete blocks and all kinds of cement and concrete products. The incorporators are L. J. Kelly, J. W. Pope, Eugene Murphy, W. F. Skinner and Charles Strong.

Australia announces that cement stone machines for molding hollow concrete building blocks may be imported free of duty.

Akron, O.—R. H. Pillmore has organized a company here to manufacture artificial stone under the American hydraulic patents.

St. Peter, Minn.—L. W. Larson has purchased the cement block manufacturing business of the St. Peter Stone and Cement Company and will continue the business.

New companies in the concrete and cement blocks field are as follows: J. M. DeLisle, Granger, Ia.; Hubert Osborne, Tilden, Neb.; J. P. Talcott, Williams, Ia.; H. C. Roloff, Welcome, Minn.; Jonn Wiebner, Durant, Ia.; C. C. Lemar, Stuart, Ia.; McCrayt Building Block Company, Kaukauna, Wis.; W. W. Bowe & Co., Bismarck, N. D.; Vrooman, Bullis & Everson, McClusky, N. D.; M. Madsen, Glencoe, Minn.; N. K. Nelson and James Murphy, Becker, Minn.; National Stone Manufacturing Company, Minneapolis, Minn.; William Branch and Dan Lewis, Williamsburg, Ia.; L. E. Fitch & Co., Worthington, Minn.; Geo. Jameison and John Henley, Devils Lake, N. D.; F. Wence and Jas. McKinley, Humeston, Ia.

Flatbush, L. I.—Special. The Roman Stone Construction Company has recently placed a large order for Hayden concrete block machines and equipment with the Hayden Automatic and Equipment Company, of 26 Cortlandt street, New York. Mr. A. S. Bedell, general manager of the company, has had a wide experience in concrete block construction. His selection of the Hayden machine is a tribute to the durability of this product as well as a reflection of the purchaser's confidence in the concrete block facing qualities of this machine.

Weehawken, N. J.—The Peerless Granite Company is erecting a large factory for its own use made entirely of concrete blocks. The Hayden concrete block machine, manufactured by the Hayden Automatic and Equipment Company, of 26 Cortlandt street, New York, will be used throughout.

Far Rockaway, L. I.—Special. George Kiser, Sr., president of the Rockaway Concrete and Lumber Company, has placed an order with the Hayden Automatic and Equipment Company, 26 Cortlandt street, New York, for a Hayden concrete block machine with which to equip his plant on Long Island. This plant is one of the largest and best equipped plants of its kind in that section for turning out products for frame houses.

Evergreen, L. I.—Special. The Art Concrete and Construction Company has just bought two concrete block machines from the Hayden Automatic and Equipment Company, of 26 Cortlandt street, New York, together with a Hayden automatic concrete mixer and a carload of equipment. This company has begun the erection of fifty apartment houses and residences to be made of concrete blocks. The location of this work is at Evergreen, Long Island, New York.

Bridgeport, Conn.—Special. The Bridgeport Real Estate Investment Company has contracted for an office building to be made of concrete blocks at Bridgeport. The company has secured for this purpose two Hayden automatic concrete block machines, a Hayden automatic

mixer and a large equipment. These machines were bought from the Hayden Automatic and Equipment Company, 26 Cortlandt street, New York.

The Hayden Automatic and Equipment Company, 26 Cortlandt street, New York, has recently sold to the Ernest Simons Manufacturing Company, of South Norwalk, Conn., a Hayden automatic concrete block machine and a large equipment for use in the erection of a plant for manufacture of linens. This plant will be 156 feet long, 56 feet wide and 38 feet in height. It will be erected entirely of concrete blocks.

PURCHASE OF MACHINERY.

South Milwaukee, Wis.—Special. John Stuessi, street commissioner, Michigan avenue, advises us that he desires to purchase tools for sewer construction, a grading outfit, sprinkler, scrapers and wheelers.

Toronto, Ont.—This city voted $20,000 for the purchase of a municipal asphalt plant.

Rochester, N. Y.—Special. The Rochester Concrete Building Material Company, 934-936 Granite Building, advise us that they are in the market for concrete building block machinery and hoisting engines.

Monroe, La.—Special. J. P. Miller, street commissioner, Box 574, advises us that he desires to purchase machinery and tools for street cleaning, sewers, garbage, street railways, etc.

Wallsburg, W. Va.—Special. George B. Sanders, Box 32, desires names and addresses of persons or firms manufacturing good movable wall forms.

South Haven, Mich.—Special. Chas. E. Aboil advises us that he desires to purchase a hollow concrete block machine.

Norwalk, O.—Special. T. P. Kellogg, county auditor, advises us that he desires to purchase pick-up sweepers.

Bowling Green, O.—Special. J. F. Gallier, C. E., desires to purchase machinery and tools for macadam roads and streets and electric railroad.

Houston, Tex.—Special. J. B. Marmion, 2113 Providence street, advises us that he desires to purchase machinery and tools for street and bridge work.

Troy, O.—Special. Larry McKee, 831 East Main street, advises us that he desires to purchase machinery for excavating, building and cement work.

Charlottesville, Va.—Special. R. W. Hohinger desires to purchase a street sprinkler to be attached to street cars.

Ipswich, Mass.—Special. Geo. R. Humphrey writes that he is in the market for contractor's tools, mixers, derricks, etc.

New York City—Special. John W. Bostick, 15 Dey street, advises us that he is in the market for tools for trench work.

Leadville, Colo.—Special. S. L. Johnson, 407 East Ninth street, advises us that he is in the market for a cement mixer and a machine for making cement and clay brick.

PURCHASE OF MATERIALS.

Leadville, Colo.—Special. S. L. Johnson, 407 East Ninth street, advises us that he is in the market for cement and all building materials.

Ipswich, Mass.—Special. Geo. R. Humphrey writes us that he is in the market for cement, sand, stone, twisted steel and expanded metal.

New York City—Special. John W. Bostick, 15 Dey street, advises us that he is in the market for reinforcing material.

Troy, O.—Special. Harry McKee, 831 East Main street, is in the market for cement and lime.

Charlottesville, Va.—Special. R. W. Hohinger advises us that he is in the market for cement and curbing.

Bowling Green, O.—Special. J. F. Gallier, C. E., advises us that he desires to purchase materials for constructing macadam roads and streets and an electric railroad.

Monroe, La.—Special. J. P. Miller, street commissioner, Box 574, advises us that he desires to purchase concrete, etc.

Boston, Mass.—Special. Stone & Webster, 84 State street, advise us that the Young Men's Christian Association, at Waycross, Ga., desires information on artificial stone for building purposes.

Chicago, Ill.—Special. The Municipal Engineering and Contracting Company, 607 Railway Exchange, is in the market for 200,000 barrels of cement.

South Milwaukee, Wis.—Special. John Stuessi, street commissioner, Michigan avenue, advises us that he desires to purchase water and sewer pipe.

Yankton, S. D.—Special. The Western Portland Cement Company advises us that a 50-room, 3-story concrete hotel is being considered for this city, and communication is desired with engineers from whom plans and a rough estimate of the cost can be promptly obtained.

MISCELLANEOUS.

Dover, N. J.—The Commonwealth Roofing Company, of New York City, contemplates erecting a large crushing plant between this city and Wharton to utilize the slag from the Wharton furnaces.

SEWER PIPE.

Louisville, Ky.—Suit for a receiver for the P. Bannon Sewer Pipe Company and an accounting of the affairs has been filed by R. C. Bannon, Gertrude O'Connor, Mollie Burrell, Lillie Hardesty and other heirs of the late Patrick Bannon, and the Louisville Trust Company, the administrator of the estate of P. Bannon, and M. J. Bannon, the son.

Patents Concerning Cement and Its Uses.

784,084. Concrete Wall Forming Machine. Geo. H. Truxell, Greensburg, Pa.

784,154. Machine for Forming Building Blocks. Henry Gutteridge and John H. McConnell, Hannota, Can.

784,158. Compound Block. Lawrence G. Hallberg, Chicago, Ill.

784,176. Mold. Jacob P. Plattenberger, Savanna, Ill.

784,420. Fence Post. Morgan L. Oliver, Mulberry, Mich.

784,476. Building Block. Benjamin W. Davis, Phillips, Wis.

784,667. Mar. 14, 1905. Fence Post Mold. Jacob B. Engstrom, Manchester, Iowa.

784,690. Adjustable Molding Machine. Israel L. Landis, Chicago, Ill.

784,866. Concrete Fence Post. Reuben H Lathers, Detroit, Mich.

784,925, 784,926. Water Tight Joint for Masonry Walls and Process of Constructing. Chas. M. Crawford, Hartford, Conn.

785,093. Mar. 21, 1905. Artificial Stone Mold. Wm. C. Fox, Waterloo, Iowa.

785,262. Molding Machine. John Lund, Woodstock, Can.

785,272. Machine for Molding Hollow Cement Blocks. Hezekiah A. Robbins, Bedford, Iowa.

785,296. Building Wall and Concrete Block for Same. Wm. H. Dunn, Richmond, Va.

785,356. Process of Making Concrete Structures. Charles R. Gow and John E. Palmer, Boston, Mass.

785,417. Fence Post. Edmund E. Gardner, Hamler, O.

785,539. Building Block. Elwood E. Benner, Sargent, Neb.

785,676. Arch. Daniel B. Luten, Indianapolis, Ind.

786,015. Mar. 28, 1905. Reinforcement for Concrete Structures. Arthur N. Doud, North Stockholm, N. Y.

786,249, 786,250, 786,251. Building Block and Machines for Forming Same. James F. Dunham, Waterloo, Iowa.

786,261. Apr. 4, 1905. Machine for Making Artificial Stone. Florentius Brichta, Holzminden, Germany.

786,272. Machine for Molding Concrete Building Blocks. Wallace L. Dow, Sioux Falls, S. D.

786,289. Concrete Beam Protection. Abraham L. A. Himmelwright, New York, N. Y.

786,370. Wall Construction. Wm. L. Marchand, Rolla, N. D.

786,566. Apparatus for Making Hollow Concrete Blocks. Wm. G. Hughes, Pittsburg, Pa.

786,598. Building Block Wall Construction. Wm. Porten, St. Paul, Minn.

786,622. Form for Constructing Concrete Steel Columns. Louis F. Brayton, St. Paul, Minn.

786,648. Concrete Structure (Railroad Tie). Edward S. Keefer, Cincinnati, O.

786,971. Apr. 11, 1905. Building Block. John H. Jones, Fostoria, O.

787,023. Facing Block. A. E. Buell, Bayonne, N. J.

787,071. Cement Mixer. Charles Brent, Rat Portage, Can.

787,099. Concrete Block Mold Machine. Edward Keagy, Newark, O.

787,157. Apparatus for Forming Cement Tanks. Jas. T. Donahoo, Edgar, Neb.

787,198, 787,199. Molding Machine and Method of Manufacturing Building Blocks. David W. Lloyd, Pittsburg, Pa.

787,375. Apr. 18, 1905. Mold for the Manufacture of Cement Blocks. Frank Gutteridge, Seaforth, Can.

787,441. Mixing Machine. James Embleton, Columbus, O.

787,512. Fireproof Construction and Method of Making Same. A. L. A. Himmelwright, New York, N. Y.

787,525. Dam. W. J. Myers, Ft. Collins, Col.

787,665. Building Concrete Walls. Reed Deeds and W. C. Deeds, Cuyahoga Falls, O.

787,743. Mold for Forming Cement Building Blocks. Billy Ely and J. L. Taylor, Rock Rapids, Iowa.

787,749. Fence Post. Alfred P. Goodell, Highland, Mich.

787,787. Concrete Building Block. Geo. L. Peabody, Pittsburg, Pa.

787,897. Apr. 25, 1905. Fence Wire Fastener. Albert Cotton, Chillicothe, Iowa.

787,931. Construction of Concrete Railroad Tie. Alonzo C. Mather, Chicago, Ill.

787,942. Compound for Paving Bricks. Theodore S. Pierce, Walla Walla, Wash.

788,175. Mold for Sewer Traps, etc. Geo. H. Taylor, Joliet, Ill.

788,366. Concrete Building Block and Wall, Charles A. Meyers, Leipsic, O.

788,391. Apparatus for the Construction of Plastic Walls. David W. Bovee, Waterloo, Iowa.

788,410. Concrete Casing. Frederick A. Koetitz, San Francisco, Cal.

788,481. Cement Block Mold. Henry F. Lightner, New Castle, Pa.

788,503. Cement Kiln. Carlton Ellis, New York City.

788,581. May 2, 1905. Mold for Making Concrete Building Blocks. Clarence G. Conger, Springville, N. Y.

788,739. Machine for Molding Plastic Blocks. Charles P. Throckmorton, Columbus, O.

788,942. Building Construction. Emile G. Perrot, Philadelphia, Pa.

788,944. Building Construction. Orvey Price, Plainfield, N. J.

788,955. Machine for Molding Building Blocks. James W. Shone, Rochester, N. Y.

789,019. Fence Post. Jacob A. Hamelback, Newark, O.

East 40th street, New York City. If

789,102. Concrete Track Construction. Henry B. Nichols, Philadelphia, Pa.

789,588. May 9, 1905. Combination Curbing and Street Sprinkling Apparatus. Geo. A. Case, Joplin, Mo.

789,610. Objects of Artificial Marble and Process of Producing Same. Robert Huelsberg, Sonneberg, Germany.

789,988. May 16, 1905. Method of Erecting Metal Concrete Structures. John S. Metcalf, Chicago, Ill.

789,992. Separating Tool for Expansible Pavements or Sidewalks. James H. Miller, Battle Creek, Mich.

789,996. Mold for Building Blocks. Elmer B. McCullough, Ypsilanti, Mich.

790,007. Means for Use in Erecting Metal Concrete Structures. James Spelman, Chicago, Ill.

790,074. Composite Post. Willie L. Northam, Arlington, Ind.

790,169. Fence Post. Charles F. Bartling, Muncie, Ind.

790,230. Method of Protecting Piles or the Like. Omar A. Stempfel, Clearwater, Pa.

790,291. May 23, 1905. Mold for Making Concrete Blocks. Frederick and Christian Eckhard, St. Louis, Mo.

790,372. Process of Making Cement-Lined Metal Pipes. John T. Langford, Newton, Mass.

790,373. Composite Tie for Railways. James MacMartin, Albany, N. Y.

790,388. Machine for Molding Artificial Stone Blocks. Andrew Peterson, Chicago, Ill.

790,413. Floor and Centering. Wm. N. Wight, New York, and Fred E. Townsend, Brooklyn, N. Y.

790,480, 790,481. Process of Molding Artificial Stone Blocks and Mold for Same. Edgar E. Crouch, Topeka, Kan.

790,507. Mold for Cement Blocks. Oscar S. Lamberson, Rock Rapids, Iowa.

790,514. Building Block. Charles W. and Robert Meara, Ogden, Utah.

790,658. Rail-Tie. Eugene Powell, Columbus, O.

790,661. Machine for Manufacturing Building Blocks. Elmo H. Reed, Wichita, Kan.

790,697. Mold for Plastic Materials. Arthur W. Mason, Jackson, Mich.

790,889. May 30, 1905. Railway Tie. Perry J. Garrison, Three Rivers, Mich.

790,904. Process of Making Brick or Artificial Stone. Lewis F. Kwiatowski, New York, N. Y.

791,065. Stair. Francis A. Winslow, Chicago, Ill.

791,076. Concrete (Column) Construction. Alex. C. Chenoweth, New York, N. Y.

791,088. Concrete Block Machine. Thos. O. Eichelberger, Dayton, O.

791,089. Cement Post. John B. Flickinger, Milwaukee, Wis.

791,207. Machine for Molding Building and Other Blocks.

791,293. Concrete Stone Construction. Nicolas Schietkiewicz, St. Petersburg, Russia.

791,380. Fence Post. Albert A. Thompson, Barrow, Ill.

791,417. Machine for the Manufacture of Hollow Building Blocks. Fred W. Hagloch, Cleveland, O.

791,446. June 6, 1905. Collapsible Form for Concrete-Steel Constructions. Louis F. Brayton, St. Paul, Minn.

791,585. Mold for Concrete Columns or the Like. Lawrence Schuller, Chicago, Ill.

791,612. Machine for Making Cement Building Blocks. Wallace L. Dow, Sioux Falls, S. Da.

791,665. Mold for Artificial Stone or the Like. Samuel A. Wilson, Newburg, N. Y.

791,875. Building Construction. Charles F. Buente, Allegheny, Pa.

791,980. Building Construction. Geo. F. Fisher, North Tonawanda, N. Y.

792,044. June 13, 1905. Molding Machine. Chas. H. Hutchings, Toronto, Can.

792,151. Machine for Molding Plastic Blocks. Jos. M. McDowell, Columbus, O.

792,221. Molding Machine for Manufacturing Building Stone. Joergen P. Joergensen, Wedel, Germany.

792,222. Roller Press for Manufacturing Cement Bricks or the Like. Joergen P. Joergensen, Wedel, Germany.

792,268. Construction of Railway Road-Beds. Amos H. Jackson, Fremont, O.

792,269. Composite Railway Tie. Amos H. Jackson, Fremont, O.

792,289. Mechanism for Constructing Concrete Walls. Wm. H. Pugh, Cincinnati, O.

792,302. Cellular Steel Fireproof Building Construction. Henry N. Wilson, Pittsfield, Mass.

792,451. Method of Erecting Walls. Emil Pruess, Berlin, Germany.

792,478. Molding Machine for Concrete Building Blocks. Lewis V. Thayer, Minneapolis, Minn.

792,593. June 20, 1905. Fireproof Wall. A. L. A. Hinmelwright, New York, N. Y.

792,605. Building of Tunnels, Waterways, or Such Like. Edward Molloy, Philadelphia, Pa.

792,830. Device for Withdrawing Templets in the Manufacture of Curbstones, etc. Albert H. Kennedy, Rockport, Ind.

793,055. June 27, 1905. Mold for Making Concrete Ties. Henry H. Clough, Elyria, O.

793,056. Mold for Concrete Curbing. Henry H. Clough, Elyria, O.

793,057. Concrete Tie, etc. Henry H. Clough, Elyria, O.

793,059. Mixing Machine for Concrete or Like Materials. Henry D. Conway, Jackson, Mich.

793,163. Railway Roadbed. Joseph L. Silsber, Chicago, Ill.

793,194. Apparatus for Constructing Circular Concrete Silos or Other Buildings. Archibald E. Hodgert, Exeter, Conn.

793,363. Molding Machine. Thos. W. Faus, Cherokee, Iowa.

793,539. Building Block Mold. John M. Pettyjohn, Terre Haute, Ind.

793,591. Building Block and Wall. Frank E. Kidder, Denver, Colo.

793,645. July 4, 1905. Foundation Wall. Lewis D. Ewing, Akron, O.

793,829. Wall Structure. Abraham W. Eager, Los Angeles, Cal.

793,893. Machine for Molding Concrete Blocks. Elizabeth and Theodor Mitelski, Alliance, O.

793,957. Coment Post and Fastener. Orange D. Reeves, Indianapolis, Ind.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

Reynoldsville, Pa. — Special. — L. S. Gourley says the streets of this city are being paved with brick.

New Albany, Ind.—At a meeting of the Board of Public Works April 16 it was decided to reject any proposition looking toward a compromise of the $80,000 damage suit of the Barber Asphalt Paving Co. that is pending in the federal court at Indianapolis. The city will take a determined stand that the work of the company in the improvement of Main st. was not in accordance with the specifications and that the contract for the improvement of the other streets of the city, that was rescinded by the City Council, is void because the company has not complied with the terms of the contract. The suit has been set for trial in the federal court May 9.

Atlantic City, N. J.—In a report submitted to the City Council April 9 City Engineer Hackney, who made a recent Western tour of inspection, stated that he prefers asphalt paving. He recommended no material from the point of an expert opinion, but expressed his own preference. A bitter fight has existed for several months between the asphalt and bitulithic members of Council regarding the choice of material for paving Atlantic avenue. At a meeting of Council April 9 the asphalt members attempted to throw out of Council the bitulithic bill and failed, but they succeeded in blocking the attempt to have it advanced on second reading. At the same meeting the bitulithic people won on two points—they prevented the

killing of the bitulithic bill and got through certain amendments, which they claim are technically in favor of other material.

CONTEMPLATED WORK.

Martins Ferry, O.—Crawford street will be paved.

Paulding, O.—Council has decided to pave Main street.

Ottawa, Kan.—Hickory, Third and Fourth streets are to be paved.

Normal, Ill.—Bids will be asked for about June 1 for brick paving.

Fergus Falls, Minn.—Bids will be asked for constructing cement sidewalks.

Sioux City, Ia.—Paving is proposed for Nebraska street from Sixth to Twenty-eighth.

Webster City, Ia.—The question of street paving is being considered.

Grand Island, Neb.—Several alley paving districts will be established here.

St. Cloud, Minn.—Paving is contemplated for St. Germain and side streets.

Madison, Wis.—The town of Blooming Grove will macadamize Atwood avenue.

Tryon, N. C.—The city will issue $5,000 bonds for macadamizing the streets.

Duluth, Minn.—Tenth avenue, E., from London road to Fourth street will be paved.

Washington, Pa.—Paving is contemplated for Wayne, Main and Greene streets.

Wheeling, W. Va.—The questing of paving the Main street hill is still being agitated.

Scranton, Pa.—A new petition is being circulated asking for the paving of Linden street.

Norfolk, Va.—The Seventh Ward is to have paved streets, sewers and other improvements.

Marinette, Wis.—Council is considering petition for macadamizing several streets.

Portland, Ind.—Petitions are being circulated asking for the paving of East and West Main street.

Fargo, N. D.—Plans are being prepared for paving North Broadway street with creosoted wood blocks.

Lincoln, Neb.—The city engineer has prepared estimates for paving with various kinds of asphalt.

Moline, Ill.—The property owners on Fifth avenue from Seventh to First streets have petitioned for paving.

Valparaiso, Ind.—Brick paving is contemplated for several streets. Wm. F. Spooner, mayor.

Atlantic City, N. J.—Concrete as a covering for the Boardwalk will be tried as an experiment.

Newport, Ky.—About 18,000 square yards of brick paving is contemplated. J. B. Morlidge, city engineer.

Brainerd, Minn.—Council has ordered five blocks in the residence district macadamized and curbed with cement.

Omaha, Neb.—An ordinance has been passed providing for the construction of permanent sidewalks on Twenty-seventh street.

Earlville, N. Y.—The construction of about 2,000 feet of cement curb and gutter is contemplated. F. E. Stafford, president.

Galesburg, Ill.—About two miles of brick paving is contemplated this summer. F. M. Connolly, city engineer.

Williamsport, Pa.—Bids will probably be asked soon for 20,000 square yards of paving. Jas. F. Fisher, city engineer.

Harrisburg, Pa.—An ordinance has been signed by the mayor for paving four blocks of Walnut street with asphalt.

Dubuque, Ia.—Bids will be asked shortly for constructing 1,000 feet of macadam paving. J. H. Boyce, city engineer.

Marietta, O.—Estimates will be prepared for paving Fort, Church, Third and Front streets with brick. A. F. Cole, engineer.

Cadiz, O.—Plans and specifications will be prepared for paving several streets, by Riggs, Sherman & Gessner, of Toledo.

Youngstown, O.—Paving is contemplated for Pennsylvania and Ohio avenues, and Baldwin and other streets surrounding Wick Park.

Mansfield, O.—City Council has passed ordinances providing for paving, sidewalks and sewers in a large number of streets.

Topeka, Kan.—Bids will be asked about June 1 for repaving Kansas avenue with asphalt. Jas. F. McCabe, city engineer.

Paducah, Ky.—Surveys are being made for 20,000 square yards of brick paving, and bids will be asked. S. A. Washington, city engineer.

Dayton, O.—City Engineer Kline has submitted estimates for paving parts of Clay, Taylor, Van Buren, Jones and other streets.

Norwalk, O.—Plans and specifications are being prepared for 6,000 lineal feet of brick paving. T. P. Kellogg, clerk Board of Public Works.

Norwood, O.—Macadam paving and sidewalks are contemplated for sundry streets. C. H. Jones, mayor; Jas. Stewart, city engineer.

Leavenworth, Kan.—Bids will be asked soon for artificial stone curbing on Miami, Kiowa and Vine streets. M. A. Przbylowicz, city clerk.

El Paso, Tex.—The property owners on San Francisco street are urging council to select that street as the first to be paved.

Chattanooga, Tenn.—A resolution has been adopted providing that nothing but tile or cement sidewalks may be hereafter constructed.

Guadalajara, Mex.—About 30,000 square meters of asphalt paving will be laid here next year by the Mexican Asphalt Paving Company.

Camden, N. J.—A resolution has been adopted providing for the paving of Broadway from Bulson street to Newton creek, with macadam.

Syracuse, N. Y.—Plans are being prepared for the construction of fifteen or twenty miles of cement sidewalks to take the place of wooden walks.

Centerville, Ia.—Plans are being prepared and bids will be asked about May 1 for one-half mile of brick paving. C. P. Chase, engineer, Clinton.

Minneapolis, Minn.—The property owners along the asphalt streets that are to be resurfaced this summer have asked for brick gutters.

Knoxville, Tenn.—An ordinance has been passed establishing three improvement districts, making about 150,000 square yards. W. C. Crozer, city engineer.

Memphis, Tenn.—The citizens' committee is raising subscriptions for paving Poplar street from Manassas to Overton Park, with asphalt.

Ashland, O.—Bids will be opened about May 19 for constructing three miles of limestone pike. F. L. Niederheiser, superintendent; C. W. Carver, clerk.

Montreal, Canada.—The council of Outremont has decided to ask for tenders for

constructing cement or granolithic sidewalks and a number of streets.

Zanesville, O.—A petition has been presented to the county commissioners asking for the improvement of the river road south of Wayne avenue.

Ann Arbor, Mich.—Several streets will be paved this year with creosoted wood blocks, vitrified brick or bitulithic paving. E. W. Groves, city engineer.

Springfield, O.—Estimates have been submitted for paving Center street from Mulberry street to Obenchain alley; with brick, asphalt or bitulithic.

Emporia, Kan.—Bids will be received about June 1 for 25,000 square yards of brick paving on concrete base on Sixth avenue. Alva J. Smith, city engineer.

Syracuse, N. Y.—The construction of seven miles of cement sidewalks in the Seventh Ward is provided for in an ordinance introduced by Alderman W. J. Apps.

Vailsburg, N. J.—Ordinances have been recommended for first and second reading providing for brick, granite block, asphalt and Telford paving in a large number of streets.

Mattoon, Ill.—Special. Claude J. James, city engineer, says ordinances have been introduced providing for the paving of several streets and alleys with brick on concrete.

New Albany, Ind.—City Engineer Coolman has been directed to prepare plans and specifications for paving parts of Spring and State streets with asphalt, and Main street with brick.

Muncie, Ind.—Bids will be asked at once for constructing 9,000 square yards of asphalt and 3,000 square yards of brick paving with five miles of combined cement curb and gutter. J. O. Potter, city engineer.

Perth Amboy, N. J.—An ordinance has been approved for paving Gordon street from Rector to Madison avenue with Warren's bitulithic pavement, crosswalks and curb. Chas. M. MacWilliam, city clerk.

Chattanooga, Tenn.—Estimates have been submitted by City Engineer Hooks for paving Centenary street, in front of the church, with chert, asphalt and brick, and a number of other streets with chert.

Norfolk, Va.—A resolution has been passed appropriating $55,000 for repaving Main street with some smooth material; $16,562 for curbing, removing and relaying the Main street Belgian blocks on Moseley, Alexander and other streets.

Springfield, O.—City Engineer Siverling has been directed to prepare estimates of the cost of macadamizing Glenn avenue between Mound and High streets, and for grading and graveling James street between Catawba and Lagonda avenues.

Hammond, Ind.—Special. A. F. Knotts, of this city, who has charge of work to be done at Gary, Ind., desires information, prices, and everything pertaining to all branches of paving, sidewalks, paving brick, cement and building materials.

St. Louis, Mo.—Mayor Wells has signified his approval of the plans for resurfacing sections of asphalt-paved streets which need repairs and on which the terms covered by the contractors' guarantee have expired. A number of streets are included in the resolution.

Tacoma, Wash.—Paving is proposed for Jefferson avenue from Pacific avenue to South E street. Sandstone blocks on concrete will be used. An ordinance has been passed for paving Puyallup avenue from Pacific avenue to East A street with fir blocks, and D street from South Seventh and St. Helena avenue to Jefferson avenue with asphalt, except at all points of crossing of cross-streets, which will be of sandstone blocks.

CONTRACTS TO BE LET.

Brazil, Ind.—Bids are asked until May 8 for graveling a road. J. Frank Smith, county auditor.

Springfield, Mo.—Bids are asked until May 1 for constructing gravel streets. W. H. Schreiber, city engineer.

Topeka, Kan.—Bids are asked until May 7 for paving several streets with brick. Jas. F. McCabe, city engineer.

Delaware, O.—Bids are asked until May 2 (new bids) for 6,000 square yards of paving. F. D. King, clerk Board of Public Works.

Bloomfield, N. J.—Bids are asked until May 7 for furnishing 2,000 tons of broken stone. Wm. L. Johnson, town clerk.

Celina, O.—Sealed bids are asked until May 5 for ditching, grading and graveling Diener road. M. Lutz, engineer.

Delphi, Ind.—Bids are asked until May 7 for grading, draining and graveling in Monroe township. F. H. Engel, county auditor.

Exira, La.—Bids are asked until May 14 for constructing cement crossings and brick walks. V. B. Hellyer, city clerk.

Ottumwa, Ia.—Bids are asked until May 7 for paving Fourth and Wapello streets with brick. W. H. O'Malley, chairman street commissioners.

Streator, Ill.—Bids are asked until May 1 for constructing 40,000 square yards of brick paving. C. A. Herbert, city engineer.

Findlay, O.—Bids are asked until May 1 for paving Center and other streets with brick. J. C. Edie, clerk Board of Public Works.

Decatur, Ind.—Bids are asked until May 7 for constructing macadamized roads in certain townships. C. D. Lewton, county auditor.

Princeton, Ind.—Bids are asked until May 8 for constructing 135,382 feet of macadamized roads. Harry R. Embree, county auditor.

Vincennes, Ind.—Bids are asked until May 8 for constructing gravel or macadam roads in Vigo township. John T. Scott, county auditor.

Madison, Ind.—Bids are asked until May 8 for constructing 12½ miles of macadam roads in Saluda township. G. F. Crozier, county auditor.

Buffalo, N. Y.—Bids are asked until May 1 for repairing the asphalt pavements during 1906 and 1907. F. G. Ward, director of public works.

Louisville, Ky.—Bids are asked until May 1 for constructing twenty miles of Jefferson county pikes. John Dyler, county road supervisor.

Dayton, O.—Bids are asked until May 1 for 11,700 square yards of brick paving with cement curb and gutter. Wm. F. Miller, clerk Board of Public Works.

Baltimore, Md.—Bids are asked until May 2 for macadamizing Wyman Park Drive, from Twenty-ninth street to Merrymans Lane. Wm. S. Manning, superintendent park board.

Michigan City, Ind.—Bids are asked until May 3 for paving Ninth street from the Monon tracks to Michigan street with brick. H. M. Miles, city engineer.

Versailles, Ind.—Bids are asked until May 8 for constructing seven miles and 3,703 feet of macadamized road in John-

son township. Nicholas Volz, county auditor.

Rockville, Ind.—Bids are asked until May 7 for constructing the Swan and Elders gravel roads, including bridging and drains. Henry Grubb, auditor.

Montgomery, Ala.—Sealed bids are asked until May 7 for 240,000 square feet of sidewalks on a large number of streets. R. S. Williams, city treasurer.

Ft. Revere, Mass.—Bids are asked until May 8 for constructing roads, digging storm water ditch and grading here. Capt. Geo. L. Goodale, Q. M.

Frankfort, Ind.—Bids are asked until May 16 for 16,000 square yards of brick paving and 8,000 square feet of cement curbing and gutters. Chas. Huffine, city engineer.

Wichita, Kan.—Bids are asked until May 7 for constructing permanent sidewalks on forty-four streets and permanent curb and gutter on six streets. R. N. Dorr, city clerk.

Anamosa, Ia.—Bids are asked until May 8 for 13,000 square yards of brick paving, 2,300 lineal feet of new curbing, and 1,000 feet of old curbing reset. L. J. Fisher, city clerk.

Ft. Snelling, Minn.—Bids are asked until May 1 for repairs and construction of cement paving sidewalks, curbing and crossings here. Capt. Amos W. Kimball, Q. M.

Montgomery, Ala.—Bids are asked until May 7 for paving South Hull and Sayre streets with vitrified brick, bitulithic, asphalt or gravel. R. S. Williams, city treasurer.

Canandaigua, N. Y.—Bids are asked until May 1 for constructing pavements and surface water drainage sewers, etc., in parts of four streets. Le Grand Brown, village engineer.

Dayton, O.—Bids are asked until May 1 for grading and graveling the sidewalks and roadways of Kammar avenue from Western avenue to Gaines street. T. M. Pexton, president Board of Public Works.

St. Paul, Minn.—Bids are asked until June 5 for constructing an approach to the Capitol from Wabasha street, with granite and cement paving and appropriate balustrading. G. H. Carsley, superintendent Capitol Commissioners.

Suffolk, Va.—Sealed bids are asked until May 11 for 40,000 square yards of vitrified brick, asphalt block, bitulithic, or granite block paving on certain streets. Col. J. H. McCleary, chairman council.

Portsmouth, Va.—Bids are asked until May 7 for 9,900 square yards of asphalt, vitrified brick, asphalt block, bituminous macadam or bitulithic paving on Lincoln and North streets, and for 4,100 feet of granite curbing.

CONTRACTS AWARDED.

El Paso, Tex.—Contract for 115,000 square yards of bitulithic pavement awarded to C. H. Wells.

Dallas, Tex.—Contract for 56,534 square yards of bitulithic pavement awarded to C. H. Wells.

Richmond, Va.—The contract for paving here was awarded to the Washington Asphalt Block and Tile Company.

Wichita, Kan.—The contract for paving Topeka avenue with brick was awarded to Wm. F. Hall, at $1.81 a square yard.

Lansing, Mich.—A paving contract has been awarded to James H. Baker & Son, of Port Huron, for $30,000.

Greenville, N. H.—The contract for constructing a macadam road here was awarded to the town of Greenville.

Baltimore, Md.—The contract for constructing concrete and cement pavements here was awarded to Chas. L. Stockhausen.

Paris, Ill.—The contract for 7,707 square yards of brick paving was awarded to R. H. Baum, of this city, April 5, for $13,070.

Lowell, Mass.—The contract for edgestones for the street department was awarded to Frank A. Mallorey, of South Chelmsford.

Columbus, Ga.—R. H. Parker was awarded the contract for 15,000 square yards of brick paving on First avenue, at $1.72½ a square yard.

Toronto, Ont.—The Warren Bituminous Paving Company, of Toronto, Ont., has been awarded 1,878 square yards of bitulithic.

Columbus, Ga.—The Southern Bitulithic Company has received an additional award of 9,000 square yards of bitulithic in that city.

Birmingham, Ala.—The council has awarded to the Southern Bitulithic Company a contract for 37,000 square yards of bitulithic.

Sheboygan, Wis.—The contract for paving Eighth street with brick was awarded to the Jones Company, of Racine, April 21, at $1.88 a square yard.

Cleveland, O.—The contract for stone paving on the East Side was awarded to the Maxwell-Rolf Stone Company, and on the West Side to the Elyria Stone Company.

Grand Rapids, Mich.—The contract for paving Stockton street, from W. Bridge to Seventeenth streets, was awarded, April 13, to Leonard Snyder, for $30,100.

Pueblo, Colo.—The contract for paving Santa Fe avenue was awarded to the Cleveland Trinidad Paving Company, for $67,814, according to press reports.

Chicago, Ill.—A contract for 14,450 square yards of bitulithic has been awarded to the Chicago Bitulithic Company for paving Sheridan Road, Lincoln Park.

Magnolia, Ill.—Trompeter & Weberling, of Peru, secured the contract for constructing 17,000 square feet of concrete walks in this village.

Spartanburg, S. C.—This city has awarded to the Southern Bitulithic Company a contract for 75,000 square yards of bitulithic paving. Bids were received on both brick and bitulithic.

Chatham, Ont.—This city has awarded to Warren Bituminous Paving Company, of Toronto, Ont., an additional contract for 4,000 square yards of bitulithic pavement.

El Paso, Tex.—The Warren Bitulithic Company, represented by D. H. Wells, of Dallas, was awarded the contract for paving various streets here for $221,620.

Birmingham, Ala.—The Southern Bitulithic Paving Company was awarded the contract, April 18, for paving Twenty-eighth, Twenty-ninth and Thirtieth streets with bitulithic, for $88,928.

Rochester, N. Y.—The Warner-Quinlan Asphalt Company, of Syracuse, was awarded the contract here, April 9, for paving East avenue from Main to Alexander streets, for $38,456.50.

Indianapolis, Ind.—A contract for paving Northwestern avenue from Fall Creek to Thirty-second street was awarded to the Hoosier Construction Company, April 20, at $3.11 a running foot. Warren's bitulithic will be used.

Belleville, N. J.—Alfonso Russomann was awarded the contract for grading Howard Place for $402.50. Philip Jannarone secured the contract for constructing sidewalks on Hornblower avenue for $614.95.

Gainesville, Fla.—The contract for laying four miles of granolithic combination curb and gutter and two miles of macadam was awarded to the Southern Fuel and Supply Company, of Jacksonville, Fla., for about $40,000.

St. Paul, Minn.—The contract for macadamizing Edgerton street from Minneapolis avenue to Forest Cemetery was awarded to J. M. Thornton for $1,575. Gleason Brothers secured the contract for macadamizing Como road, for $7,047.

Richmond, Ind.—August A. Turner was awarded the contract for constructing cement sidewalks on North C street at 55 cents a lineal foot, and John H. A. Schneider the contract for cement sidewalks on North Thirteenth street at 67 cents a lineal foot.

Shelbyville, Ind.—A contract for 40,000 square yards of bitulithic paving was awarded to the Hoosier Construction Co., of Indianapolis, April 7, at $1.98 a square yard. The Western Construction Co., of Lafayette, bid $2.05 a square yard.

St. Louis, Mo.—The Heman Construction Co. was awarded the contract, April 10, for paving Bernays avenue with macadam, for $6,019, and the Granite Bituminous Paving Co. the contract for bituminous macadam paving on Hamilton avenue, for $41,274.

Binghamton, N. Y.—The contracts for paving Susquehanna and Chenango streets with block were awarded to A. D. Osborn at $1.77 a square yard. Clearfield repressed block will be used in paving Susquehanna street and Reese-Hammond repressed block on Chenango street.

St. Louis, Mo.—The Trinidad Asphalt Co. was awarded a contract April 13 for paving Julian avenue from Clara to Hodiamont avenues with asphalt for $28,112. Other contracts awarded on the same date for street and alley paving, using brick, amounted to $172,068.30.

Hattiesburg, Miss.—The contract for paving the business streets was awarded April 12 to the Southern Construction Co., of Chattanooga, Tenn., and the contract for paving the residence streets with bitulithic was awarded to the Southern Bitulithic Co., of Nashville. The contracts will amount to $106,000.

Saginaw, Mich.—Bids for street paving were submitted April 12 as follows: Barber Asphalt Paving Co., sheet asphalt, $1.46 a square yard; Trinidad, $1.52; Pitch lake, $1.57; bituminous macadam, $1.61; Saginaw brick, $1.61. Cleveland Trinidad Co., sheet asphalt, $1.39, Trinidad or Bermudez; or Saginaw brick, $1.45, Capital Asphalt Co., any kind of asphalt or Saginaw brick, $1.39; bituminous macadam, $1.54. Central Bitulithic Co., bitulithic paving, $1.83, contracts not to be for less than 10,000 square yards. John C. Davies, brick, $1.40. C. H. McOmber & Co., brick, $1.37.

Indianapolis, Ind—A contract for the repair of asphalt and vulcanite streets was awarded April 11 to the Marion County Construction Co., of this city, at 98 cents a square yard for resurfacing streets and 50 cents for resurfacing and laying new concrete base combined. The Union Asphalt Construction Co. bid 83 cents for resurfacing and $1.60 for new base and surface. City Engineer Miller estimated that 15 per cent. of the work to be done will be of the combined class, and that upon such basis the Marion County Construction Co. would be 4 per cent. lower than the Union Construction Co.

New York City.—Contract for grading, curbing and constructing sidewalks in Long Island City were awarded April 2 by Joseph Bermel, president of Queens, as follows: Beebe avenue, 2,750 feet, H. J. Mullin, $26,386; Thos. A. Brown, Sixth avenue, $5,706; Dutch Kills street, $2,623.75; Seventh avenue, $10,804; Crescent street, $12,652.50; Wilbur avenue, $5,641; Washington avenue, $15,990; Eighth avenue, $11,195.10. The Barber Asphalt Paving Co. was awarded the contract for regulating, grading, curbing and laying sidewalks and paving with asphalt on concrete base on North Washington place for $3,859.30.

Chicago, Ill.—The Barber Asphalt Paving Co. was awarded the contract for paving Ogden ave. from Albany to Fortieth avenues April 12 for $134,036, or $1.95½ a square yard. The R. F. Conway Co. was awarded contracts as follows: Ashland avenue, asphalt, $1.91 a square yard; Clifton avenue, asphalt, $1.85; Clinton street, $2.96; Seminary avenue, granite concrete, $1.85. Other contracts awarded were as follows: Slag paving in vicinity of 109th street, Farr Bros., 83 cents a square yard; Erie avenue, slag, Illinois Improvement and Ballast Co., $1.15; Fawler street, asphalt, Barber Asphalt Co., $1.89. Grace street, granite, $1.22; Hayne avenue, slag, $1.20, and Wayne avenue, granite concrete, $1.41, James A. Sackley.

Green Bay, Wis.—Bids were submitted April 17 for paving Main, Washington and Pine streets with asphalt as follows: The Andrews Asphalt Co., Chicago, Bermudez Pitch lake asphalt, Main street, $42,276.42; Washington, $32,646.64; Pine, $7,291.24. Thos. J. Peters Co., Chicago, California asphalt, Main street, $40,845; Washington, $31,445; Pine, $7,000. Guelich & Delaney, giving a choice of three different kinds of asphalt, Main street, $37,925.95; Washington, $29,315.20; Pine, $6,849.95. Barber Asphalt Co., Trinidad pitch lake asphalt, Main street, $42,543.61; Washington, $32,858.16; Pine, $7,341.88. Barber Asphalt Co., Genasco asphalt, Main street, $39,412.46; Washington, $30,446.87; Pine, $6,807.02. Flatley Bros., El Oso, a California asphalt, Main street, $38,877.30; Washington, $29,790.26; Pine, $7,059.66. Action on the bids was deferred until the merits of the different asphalts can be investigated.

SEWERS.

CONTEMPLATED WORK.

Menasha, Wis. — Sewers are proposed for several streets.

Dickinson, N. D.—This city is planning to build sewers.

Norfolk, Neb.—Voted to issue bonds for a sewerage system.

Sheboygan, Wis.—Bids will be asked soon for building a sewer in Kentucky avenue.

Dallas, Tex.—Leon Dalton, cy. engr., says larger storm sewers are needed.

Winnebago, Minn. — The question of building a sewerage system is being agitated.

Durant, I. T.—This city voted to issue $20,000 to establish a sewerage system.

Mooresville, Ind. — A resolution has been passed for constructing a sewerage system.

Merchantville, N. J. — This borough voted to issue bonds for constructing a sewerage system.

Carmi, Ill.—A new sewerage system is to be constructed in the business section of this city.

Dawson, Ga.—This city voted to issue $35,000 5 per cent. bonds for building a sewerage system.

Peoria, Ill.—The construction of the North Peoria sewer is contemplated, at a cost of $233,000.

Verona, N. J.—Plans have been submitted to the committee of Verona township for the disposal of sewage.

Rochester, N. Y.—A new sewer will be constructed through Windsor Beach, Summerville and White City.

Marion, Ind.—The city engineer has been directed to prepare a resolution for constructing a new sewer.

Scotia, N. Y. — The State Board of Health has approved plans for constructing additional sewers here.

Jamestown, N. Y.—The Board of Public Works has recommended the construction of 14,291 feet of sewer this year.

Williamsport, Pa.—Bids will be asked soon for constructing about 1 mile of sewer. Jas. F. Fisher, cy. engr.

Thomasville, Ga.—Plans for the extension of the sewerage system will be prepared by H. S. Jaudon, of Savannah.

Oakland, Cal. — Plans for completing the sewerage system of this city have been prepared by City Engineer Turner.

Gaysport, Pa.—The ordinance providing for the construction of a sewerage system has been passed by Burgess McGillen.

Binghamton, N. Y.—Plans for the proposed Fourth ward sewer will be prepared by Henry M. Ogden, of Cornell University.

Schenectady, N. Y.—Plans have been completed for the extension of the sewerage system. Geo. Holtzman, comr. pub. wks.

Plainfield, N. J.—Bids will be received until May 7, according to press reports, for extending the sanitary sewer system.

Livermore Falls, Me.—About 4¼ miles of various sized sewer pipe is to be laid. Edwin Riley, chmn. com. on sewers.

Knoxville, Tenn.—W. C. Crozer is preparing plans and specifications for a sanitary and storm sewer for North Knoxville.

New Albany, Ind.—City Engineer Coolman has been directed to prepare plans for extending the sewerage system on Culbertson avenue.

Lancaster, O.—Resolutions have been passed for constructing storm water sewers in districts Nos. 1 and 3. Lefford Pursell, mayor.

Des Moines, Ia.—Plans are being prepared for a sewer system for the district between Kingman and Forest avenues and Thirtieth and Thirty-fifth streets.

Salem, O.—Plans have been approved for a trunk-line sewer, with an amendment that the plans include a system for the south side of the city as well as the north side.

Ligonier, Pa. — Application has been filed with the State Board of Health for permission to construct a sewerage system. Frank M. Keffer, clk. Coun.

Elgin, Ill. — Ordinances were passed April 17 providing for the construction of storm water sewers in Ann street and Lincoln and Bellevue avenues at an estimated cost of $35,840.

Cleveland, O. — The county buildings commission has authorized its secretary to procure bids for deflecting the Ontario-street sewer, the work to be done under the supervision of the city engineer.

Butte, Mont.—Plans for 2 miles of sewers on the West Side, west of Excelsior street, east of the School of Mines, north of Iron and south of Granite streets, will be prepared by Frank Bickenbach, cy. engr.

Dayton, O. — Ordinances were passed April 9 for the enlargement of the Fourth-street sewer and a new pumping station, at a cost of $20,000; a storm water sewer on North and South Broadway, at a cost of $39,000.

Bakersfield, Cal.—J. L. Evans, city engineer, visited Marysville April 14 to inspect the sewerage system of that city. This city has decided to expend $120,000 in improving and extending the present sewerage system.

Hammond, Ind.—Special. A. F. Knotts, of this city, who has charge of construction work in the new city of Gary, Ind., desires information, prices and everything pertaining to constructing a sewerage system, sewer pipe, catch basins, sewer inlets, etc.

CONTRACTS TO BE LET.

Pipestone, Minn.—Bids are asked until May 12 for constructing sewers. S. W. Funk, cy. rec.

Springfield, Mo.—Bids are asked until May 1 for constructing several sewers. W. H. Schreiber, cy. engr.

New Ulm, Minn.—Bids are asked until 5 p. m. May 1 for constructing five blocks of sewers. Ernst Wicherski, cy. clk.

Escanaba, Mich.—Bids are asked until June 15 for constructing Newaygo Hill sewer. D. A. Brotherton, cy. engr.

Grand Rapids, Mich.—Bids are asked until May 1 for constructing an 8 to 30-inch tile sewer. L. W. Anderson, cy. engr.

Norwich, N. Y.—Bids are asked until May 4 for constructing 15,000 feet of 8 to 10-inch sewers. T. D. Miller, prest. Bd. Sewer Comrs.

New Orleans, La. — Sealed bids are asked until May 8 for constructing 80 miles of sewers and appurtenances. F. S. Shields, sec. Sewerage and Water Bd.

Edgeworth, Pa.—Sealed bids are asked until May 12 for constructing 14,000 feet 12 to 36-inch sewers and appurtenances. E. P. Lord, prest. Coun.

Elkhart, Ind.—Sealed bids are asked until May 11 for constructing a trunk line sewer 20 to 30 inches in diameter, about 4,500 feet long. Emil V. Anderson, cy. clk.

Hillsboro, N. D.—Bids are asked until May 7 for constructing sewers as follows: 1,521 feet 27-inch trunk sewer; 478 feet lateral sewer and outfall; relaying Caledonia-avenue sewer. Thos. Fords, cy. audt.

Ravenna, O.—Bids are asked until May 15 for constructing 13½ miles of 8 to 18-inch pipe sewers, furnishing 13½ miles vitrified clay pipe sewer, constructing sewage disposal plant. E. W. Marvin, vil. clk.

Waitsburg, Wash.—Bids are asked until May 7 for constructing 1,300 feet 4-inch, 14,530 feet 6-inch and 2,700 feet 8-inch pipe sewer; 4, 6 and 8-inch Y's; 50 manholes; 1 flush tank; 1 septic tank; 1 filter bed. C. E. Bateman, cy. clk.

Jacksonville, Fla. — Sealed bids are asked until 3 p. m. May 4 for furnishing and laying 2,330 feet 14-inch, 6,634 feet 12-inch and 4,841 feet 10-inch c. i. sewer, 1,778 feet 10-inch and 38,527 feet 8-inch terra cotta sewer, with Y branches and manholes. B. F. Dillon, chmn. trus.

CONTRACTS AWARDED.

Sterling, Ill.—The contract for building sewers was awarded to Rouke & Ridge.

Louisville, Ky.—R. L. Clark secured the contract for building a sewer in 26th street.

Exeter, Pa.—The contract for building a new sewer was awarded to John McGrath.

Nashville, Tenn. — The contract for building a 30-inch radiated brick sewer in Main street was awarded to T. V. Barnsfield.

Boise, Ida.—C. C. Stevenson was awarded a contract April 7 for building a lateral sewer.

Portsmouth, O.—Samuel P. Baird was awarded the contract for constructing the Robinson-avenue sewer.

Alton, Ill.—The contract for building a sewer in Third street was awarded to J. S. Cuthbertson for $6,000.

Burlington, Ia.—The contract for constructing Stony Lonesome sewer was awarded to the Burlington Construction Co.

Beverly, Mass.—The contract for building a sewer was awarded to A. G. Tomassels, 36 Spring street, Boston, for $28,000.

Franklin, Va. — The contract for installing a sewerage and water-works system was awarded to the Southern Contracting Co., of Norfolk, Va.

WATER WORKS.

Houston, Tex.—This city will vote May 17 on the question of purchasing the plant of the Houston Water Co.

Stoyestown, Pa. — The Stoyestown Water Co. has been incorporated by J. H. Gardner, Edward Smith, C. S. Shockey, H. E. Swartz and Geo. S. Lohr.

Chillicothe, Mo—The Chillicothe Water Co. has filed suit against this city for $2,225 alleged to be due for water furnished for hydrant use during the last six months.

Indianapolis, Ind. — The Indianapolis Water Co. has distributed pipe for the improvement of the fire protection in the central part of this city. Large new mains will be directly connected with the 36-inch main that carries water from the Riverside pumping station. The estimated cost of the proposed improvements is $45,000.

CONTEMPLATED WORK.

Central City, Col. — Plans are being prepared for improving the city water system.

Sault Ste. Marie, Mich.—This city voted to establish a universal water-meter system.

Wauseon, O.—The question of building a new water-works plant is under consideration.

Winona, Minn.—A new pump and boiler have been recommended by the water commissioner.

Lowell, Mass.—The extension of the city water system to North Chelmsford is proposed.

Leesburg, O.—Special. W. W. Masters says this city will soon be in the market for water pipe, pumps, etc.

Pittsfield, Mass.—The adoption of a meter system has been recommended by a special committee on water supply.

Selma, Mich.—Special. V. B. Atkins, mayor, says this city voted in favor of issuing $150,000 bonds for a water plant.

The extension of water mains is proposed at the following places: Youngstown, O.; Springfield, O.; Pontiac, Mich.; Kewanee, Ill.

The question of issuing bonds for water works construction will be voted on as follows: Leesburg, Va., May 1; Tecumseh, O. T., May 8; Hagerstown, Ind., in May.

Pittsburg, Pa.—Adequate water service in the 14th, 23d, 21st, 20th, 19th, 18th and 17th wards is promised during the present administration.

Pawtucket, R. I.—City Council appropriated April 11 $300,000 for installing additional pumping facilities in connection with its present water-works system.

Pekin, Ill.—Albert Weiss and Geo. H. Lucas, of this city, representing a syndicate of Chicago and Milwaukee capitalists, have asked for a water-works contract here.

Holyoke, Mass.—The Board of Water Commissioners contemplates installing about 60 6-inch two-way hydrants and laying 6,500 feet 12-inch main pipe this year. A. E. Pickup, registrar water comrs.

Bristol, Tenn.—Council received a proposition April 13 from the Bristol-Goodson Water Co. to sell its entire system for $150,000. The offer has been referred to a special water committee.

The question of issuing water-works bonds has been favorably voted on at the following places: Cairo, Ga.; Holton, Kan.; Sheldon, N. D.; Gilmer, Tex.; Elk City, Kan.; Cambridge, Neb.; Marshall, N. C.

Hammond, Ind.—Special. A. F. Knotts, of this city, who is in charge of the work of constructing Gary, Ind., desires information, prices and everything pertaining to the construction of water works, etc.

The construction of a water-works system is contemplated at the following places: North Amherst, O.; Kelliher, Minn.; Madill, O. T.; Dickinson, N. D.; Torah, Minn.; Willow City, N. D.; Petersburg, Fla.; Charlton, Ia.; Bourbonnais, Ill.; Cleveland, Minn.; Moss Point, Miss.; Hellam, Pa.

New York City.—In a report submitted to Mayor McClellan Water Commissioner Ellison recommends that instead of the plans furnished by the Burr-Herring-Freeman Water Commission and the Aqueduct Board for filtration plants that the city concentrate its energies on a huge filtration plant in the eastern half of the Jerome Park reservoir. This filtration plant will cost more than $10,000,000.

Washington, D. C. — The Bureau of Manufactures state they have had an inquiry from a Mexican water supply company for the name of a manufacturer of cement pipe. The company intends taking up the iron pipes now laid, which rust out, and substitute molded cement pipes to carry water 20 miles. The pipes are to be 14 inches inside diameter, withstanding an internal pressure of 40 to 60 pounds to the square inch.

CONTRACTS TO BE LET.

Elk City, O. T.—Bids are asked until May 11 for constructing a water-works system.

Mt. Vernon, O.—Bids are asked until May 15 for water-works improvements. J. H. Wootton, clk. B. P. S.

Minneapolis, Minn. — Bids are asked until May 7 for sinking a well at the county farm. H. R. Scott, co. audt.

Aurora, Minn.—Bids are asked until June 1 for constructing a water-works system. F. V. Anderson, vil. rec.

Winfield, Kan.—Bids are asked until May 10 for constructing a water-works system. J. O. Yeager, cy. clk.

Bayonne, N. J.—Bids are asked until May 1 for furnishing 20 1-inch and 80 ¾-inch water meters. W. C. Hamilton, cy. clk.

Rockford, Ill.—Bids are asked until May 25 for furnishing a pumping engine. Frank J. Phinney, supt. w. w.

Poplar, Mont.—Bids are asked until May 22 for improving the water system at Ft. Peck school. C. B. Lohmiller, capt.

Belleville, Kan.—Bids are asked until May 15 for certain improvements to the water-works system and plant. J. B. Peach, cy. clk.

New Orleans, La. — Sealed bids are asked until May 15 for furnishing and laying 100 miles of c. i. water pipe 4 to 24 ins. F. S. Shield, secy. Sewerage and Water Bd.

Perrysburg, O.—Bids are asked until May 7 for trenching, pipe laying and back filling for the proposed water works. R. R. Hartshorn, clk. Bd. Trustees Bd. Pub. Affairs.

Wyoming, O. — Bids are asked until May 1 for furnishing and lining with concrete and asphalt the present storage reservoir. Wm. S. Stearns, chmn. Bd. Trustees Pub. Affairs.

Cincinnati, O.—Bids are asked until May 8 for constructing a head house, chemical house, filter house, valve houses and wash-water reservoir, etc., in connection with the filter plant and settling reservoirs. Aug. Herrmann, prest. Bd. Trustees.

CONTRACTS AWARDED.

Auburn, N. Y.—The contract for extending the intake pipe was awarded to Henry P. Burgard, of Buffalo, for $8,400.

Colquitt, Ga.—Council awarded a contract April 16 to I. Kwilecki, of Bainbridge, Ga., for constructing a water-works system.

Hattiesburg, Miss.—The contract for constructing water-works extensions was awarded to E. J. O'Bierne, of Atlanta, Ga., for $22,936.

Franklin, Va.—The contract for constructing a water-works and sewerage system was awarded to the Southern Contracting Co., of Norfolk, Va., for $34,019.

Harrison, Ark.—This city has granted a franchise to J. B. Quigley and J. C. Settle, of St. Louis, to construct water-works, gas and electric-light plants.

Orange, N. J.—Contracts were awarded April 16 for furnishing and laying pipe for the new water-works system as follows: Furnishing 2,200 tons 20-inch c. i. pipe and 20 tons of special castings, Warren Foundry and Machine Co., $66,000; laying mains from Campbell's pond to Orange pumping station, Ludwig Batt, of South Orange, $35,000.

Kansas City, Kan.—A water franchise was granted L. M. Miller and K. L. Browne April 12 by the City Council. Under the terms of the franchise the work of construction of a new water-works system will have to begin within five months from the date of the granting of the franchise. The franchise of the Metropolitan Water Co. expires Dec. 13.

BRIDGES.

Lawton, O. T.—Bids are asked until May 14 for building 4 steel bridges. Co. comrs.

Asheville, N. C. — Commissioners of Buncombe county have authorized the construction of 5 steel bridges.

Fort Madison, Ia. — A concrete arch bridge on the West Point road is contemplated by the county supervisors.

Lawrence, Mass.—A commission has been appointed to consider the question of building a bridge over Merrimac river.

Jefferson, O.—Bids are asked until May 17 for constructing bridges and bridge abutments. P. C. Remick, co. audt.

Missoula, Mont.—Citizens voted to issue $20,000 bonds for building a bridge over Missoula river at Van Buren street.

Wilkesbarre, Pa.—Bids are asked until May 25 for building a steel and iron girder bridge. Fred H. Gates, cy. clk.

Alexandria, La.—Bids are asked until May 22 for a steel bridge across Bayou Boeuf at Cheneyville. Rapsides Police Jury.

Troy, N. Y.—Bids for building a new bridge over the Wynantskill at Winter street will be received May 11. Bd. Contr. and Sup.

Albert Lea, Minn.—Bids are asked until May 3 for building a steel bridge on Lake View boulevard. Wm. Barneck, cy. engr.

Belle Fourche, S. D.—Bids are asked until May 15 for constructing 5 steel highway bridges. R. F. Walter, engr. in charge.

Mishawaka, Ind.—Plans are being prepared and bids will be asked about May 1 for building one bridge. Wm. S. Moore, cy. engr.

Lawrence, Ind.—Bids are asked until May 7 for constructing a reinforced concrete arch bridge. Capt. B. F. Cheatham, const. Q. M.

Lincoln, Neb. — Bids are asked until May 8 for building a wagon bridge across Republican river near Trenton. John H. Brown, co. clk.

Grand Forks, N. D.—Bids are asked until May 5 for building all steel bridges erected during the year. Hans Anderson, co. audt.

Twickenham, Ore.—Bids are asked until May 2 for constructing a steel bridge over John Day river. H. F. Heidlman, co. surv., Fossil, Ore.

Pawnee, O. T.—Bids are asked until May 14 for the sale of eight 1,190-foot reels of 1½-inch galvanized bridge cables. C. R. Adams, co. clk.

San Juan, P. R.—Bids are asked until May 19 for furnishing and erecting a dock and a steel highway bridge here. J. J. Jimenez, supt. pub. wks.

Henderson, Tenn.—J. D. Johnson, W. C. Trice and others have been appointed a committee to investigate the question of building 3 steel bridges over Forked Deer river.

Frankfort, Ind.—The contract for constructing 26 new concrete bridges in various parts of this county was awarded to

Bercaw & Adams, of Lebanon, and Kelleher & Slipher, of this city, at prices ranging from $200 to $6,350.

Souris, Man. — Bids are asked until May 19 for constructing 2 steel spans and concrete abutments across Souris river at Monteith Junction; constructing concrete culvert through creek 1 mile east of Souris. J. W. Broakey, secy.-treas. municipality of Glenwood.

STREET LIGHTING.

Pike, N. Y.—Voted to install an electric-light plant.

Painesville, O.—A municipal electric-light plant is favored.

Pender, Ore.—Council voted to issue bonds for erecting an electric-light plant.

Norwood, Mass.—Citizens voted April 9 to construct a municipal electric-light plant.

St. Paul, Minn. — Designs for ornamental lights on Sixth street have been made by A. H. Stem, arch.

Norwood, Mass.—This town decided to establish and maintain a municipal electric-light plant.

Newark, N. J.—The Board of Trade has declared in favor of a municipal electric-light plant.

Monroe, Mich.—Council has decided to issue $8,500 bonds for repairing the municipal lighting plant.

Sault Ste. Marie, Mich.—This city voted to issue bonds for establishing a municipal electric-light plant.

Belleville, Kan.—Bids are asked until May 15 for installing a complete electric-light plant. J. B. Peach, cy. clk.

Livingston, Mont. — The contract for lighting the streets for 5 years was awarded to J. L. Bright at $90 a year.

Calgary, Ont.—City Council has authorized expenditure of $30,000 to double the capacity of the municipal lighting plant.

Albany, N. Y.—Gov. Higgins signed the Page-Agnew bill April 3 fixing the price of gas in New York city at 80 cents after May 1.

Toledo, O.—An ordinance was introduced in Council April 16 authorizing the B. P. S. to ask for bids for electric lighting for 5 and 10 years.

Fostoria, O.—B. P. S. has asked Council to submit to vote the question of issuing $50,000 bonds for installing electric-light plant.

Avalon, N. J.—Frank von Boyneburgh and C. B. Kates have been appointed a committee to arrange for the erection of an electric-light plant.

Sharpsburg, Pa.—Bids are asked until May 4 for one 200-k.-w. alternating current generator, one 200-h.-p. engine, etc. A. H. F Black, boro clk.

Harrison, Ark.—A franchise has been granted to J. B. Quigley and J. C. Settle, of St. Louis, for constructing gas and electric-light plants.

Cannon Falls, Minn.—Bids will be received June 1 (change of date) for constructing a power plant on Cannon river. H. von Schon, engr., 34 W. Congress street, Detroit, Mich.

Morrisville, Va.—The water and light committee has been directed to build a large dam across the Lamoille river at Cady's Falls, to furnish power for a municipal power station.

Hammond, Ind.—Special. A. F. Knotts, of this city, who is in charge of construction work at Gary, Ind., desires information, prices and everything pertaining to electric lighting, etc.

Bordentown, N. J.—The contract for lighting the city for 5 years was awarded to the Bordentown Electric Light and Motor Co. at $90 per light per year for arc lights and $18 per light per year for incandescent lights.

West Pittston, Pa.—The contract for lighting the streets of this borough was awarded to the Citizens' Illuminating Co., of Pittston, for 5 years at $15.50 per light per year for incandescent lights and $60 each for arc lights.

Buffalo, N. Y.—The Buffalo General Electric Co. was awarded the contract for supplying electric street lights for 5 years at $56 per light per year for street arc lights and a maximum charge to private consumers of 9 cents a kilowatt-hour.

New York City.—Bids are asked until May 3 for installing a new underground system of feeders for supplying electric lights to the various buildings and chapels, etc., and furnishing outside lights to entrances to buildings on Hatt's Isalnd. Francis J. Lantry, comr. correction.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

Waukegan, Ill.—A garbage plant is proposed.

Calgary, Alta.—City Council has authorized expenditure of $10,000 for a crematory.

Terre Haute, Ind.—Paul J. Meredith was awarded the garbage contract for 3 years at $6,400 a year.

Superior, Wis.—Bids are to be received during May for collecting city garbage for 1 year. J. A. Rene, health officer.

Tampa, Fla.—The contract for constructing a 100-ton incinerating plant was awarded to the Dixon Garbage Co. for $27,000.

Washington, D. C.—Bids are asked until May 7 for cleaning the streets, avenues and alleys. H. B. F. MacFarland, chmn, dist. comrs.

Little Falls, N. Y.—A committee consisting of the city attorney, city engineer and health officer has been appointed to investigate the question of garbage disposal.

Indianapolis, Ind.—Sprinkling contracts were awarded as follows: District No. 1, F. Reeder, $17.90 per 10,000 square feet; Nos. 2 and 6, Henry T. Nolting, $16.84 and $14.48, respectively; Nos. 3 and 5, Frank Kennington, $15.70 and $13.61; No. 4, Frank Fuehring, $15.60.

PARKS.

Grand Rapids, Mich.—A 25-acre tract of land has been presented to this city for a public park.

Minneapolis, Minn. — A 10-acre tract near the northeast pumping station will be converted into a park.

Chattanooga, Tenn.—Efforts are being made to beautify the land surrounding the National Cemetery, which was transferred to this city by the U. S. government several years ago.

WANTED—Superintendent and foremen for asphalt paving and general contract work in Central West. THE PARKER-WASHINGTON CO., Chamber of Commerce, Chicago.

WANTED—50,000 barrels Portland cement for Chicago, St. Louis and Kansas City delivery this year. Address, Chicago, St. Louis and Kansas City office. THE PARKER-WASHINGTON CO.

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NOTICE TO CONTRACTORS.

Sealed proposals will be received at Indianapolis, Indiana, until May 4, 1906 (readvertisement), for sprinkling in District No. 6.

The Board of Public Works reserves the right to reject any or all bids. JOSEPH T. ELLIOTT, Chairman Board of Public Works.

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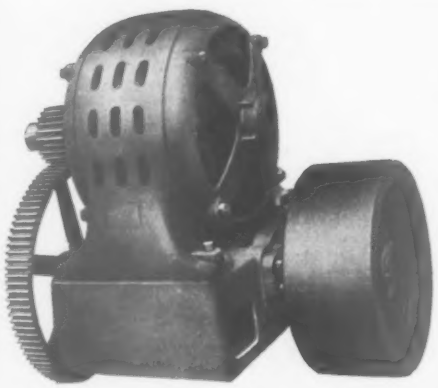

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